CHEMISTRY

BOOKS - UNIVERSAL BOOK DEPOT 1960

CHEMISTRY (HINGLISH)

GASEOUS STATE

Ordinary Thinking Objective Questions Characteristics And Measurable Properties Of Gases

1. At STP, the order of mean square velocity of molecules of H_2, N_2, O_2, and HBr is

A. $H_2 < N_2 < O_2 < HBr$

B. $HBr < O_2 < N_2 < H_2$

C. $H_2 < N_2 = O_2 < HBr$

D. $HBr < O_2 < H_2 < N_2$

Answer: c

Watch Video Solution

2. Which one of the following statements is wrong for gases?

A. Gases do not have a definite shape and volumne

B. Volume of the gas is equal to the volume of the container confining the gas

C. Confined gas exerts uniform pressure on the walls of its container in all directions

D. Mass of the gas cannot be determined by weighing a container in which it is enclosed

Answer: D

Watch Video Solution

3. Which of the following exhibits the weakest intermolecular forces?

A. NH_3

B. HCl

C. He

D. H_2O

Answer: C

Watch Video Solution

4. 2gm of O_2 at $27^\circ C$ and 76mm of Hg pressure has volume

A. 1.5 lit

B. 2.8 lit

C. 11.2 lit

D. 22.4 lit.

Answer: A

Watch Video Solution

5. Which of the following statements is not correct about the three states of matter, i.e., solid, liquids and gas?

A. Molecules of a solid possess least energy whereas those of a gas possess highest energy

B. The density of solid is highest whereas that of gases is lowest

C. Gases like liquids possess definite volumes

D. Molecules of a solid possess vibratory motion

Answer: C

Watch Video Solution

6. The temperature and pressure at which ice, liquid water and water vapour can exist together are

A. 0° C,atm

B. $2^\circ C$, 4.7 atm

C. 0° C, 4.7 mm

D. $-2^\circ C$, 4.7 mm

Answer: C

Watch Video Solution

7. Which of the following is true about gaseous state?

A. Thermal energy $=$ Molecular attraction

B. Thermal energy $>>$ Molecular attraction

C. Thermal energy $<<$ Molecular attraction

D. Molecular forces $>>$ Those in liquids

Answer: B

Watch Video Solution

8. Kinetic energy of molecules is highest in

A. Gases

B. Solids

C. Liquids

D. Solutions

Answer: A

Watch Video Solution

9. The volume of 1 litre is equal to

A. $1000cm^3$

B. $100cm^3$

C. $10dm^3$

D. 10^6cm^3

Answer: D

Watch Video Solution

10. A $1^\circ C$ rise in temperature is observed in a conductor by passing a certain current . If the current is doubled , then the rise in temperature is approximately

A. $1^\circ F$

B. $9/5^\circ F$

C. $5/9^{\circ}F$

D. $33^{\circ}F$

Answer: B

Watch Video Solution

11. Which of the following relations for expressing volume of a sample of NOT correct?

A. $1L = 10^3 ml$

B. $1dm^3 = 1L$

C. $1L = 10^3 m^3$

D. $1L = 10^3 cm^3$

Answer: C

Watch Video Solution

12. One atmosphere is equal to

A. 10^6 dynes cm^{-2}

B. 10^6 dynes cm^{-2}

C. 10^4 dynes cm^{-2}

D. 10^8 dynes cm^{-2}

Answer: A

Watch Video Solution

13. Pressure of a gas in a vessel can be measured by

A. Barometer

B. Manometer

C. Stalgometer

D. All the above

Answer: B

Watch Video Solution

14. Assertion: Wet air is heavier than dry air.

Reason: The density of the dry air is more than density of water.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer: D

Watch Video Solution

15. Assertion: All molecules in a gas are moving with same speed.

Reason: Speed of molecules in a gas follows Maxwell's distribution law.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: D

Watch Video Solution

16. Assertion: Effusion rate of oxygen is smaller than nitrogen.

Reason: Molecular size of nitrogen is smaller than oxygen.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

Watch Video Solution

17. Assertion : 4.58 mm and $0.0098^{\circ}C$ is known to be triple point of water.

Reason : At this pressure and temperature all the three states i.e., water , ice and vapour exist simulataneously.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

Watch Video Solution

Ordinary Thinking Objective Questions Ideal Gas Equaion And Related Gas Laws

1. Pressure remaining the same, the volume of a given mass of an ideal gas increases for every degree centigrade rise in temperature by define fraction of its volume at

A. $0^\circ C$

B. Its critical temperature

C. Absolute zero

D. Its Boyle temperature

Answer: A

Watch Video Solution

2. Correct gas equation is :

A. $\frac{V_1T_2}{P_1} = \frac{V_2T_1}{P_2}$

B. $\frac{P_1V_1}{P_2V_2} = \frac{T_1}{T_2}$

C. $\frac{P_1T_2}{V_1} = \frac{P_2V_2}{T_2}$

D. $\frac{V_1V_2}{T_1T_2} = P_1P_2$

Answer: B

Watch Video Solution

3. If P, V, M, T and R are symbols of pressure, volume, molecular weight, temperature and Gas contstant, what is the equation of density of ideal gas

A. $\frac{RT}{PM}$

B. $\frac{P}{RT}$

C. $\frac{M}{V}$

D. $\frac{PM}{RT}$

Answer: D

Watch Video Solution

4. At constant temperature, in a given mass of an ideal gas -

A. The ratio of pressure and volume always remains constant

B. Volume always remains constant

C. Pressure always remains constant

D. The product of pressure and volume always remains constant

Answer: D

Watch Video Solution

Watch Video Solution

5. In a closed vessel of 5 litres capacity, 1 g of O_2 is heated from 300 to $600K$. Which statement is not correct ?

A. Pressure of the gas increases

B. The rate of collision increases

C. The number of moles of gas increases

D. The energy of gaseous molecules increases

Answer: C

Watch Video Solution

6. If pressure becomes double at the same absolute temperature on $2LCO_2$, then the volume of CO_2 becomes

A. 2 litres

B. 4 litres

C. 5 litres

D. 7 litres

Answer: A

Watch Video Solution

7. A weather balloon filled with hydrogen at 1 atm and $27^\circ C$ has volume equal to 1200 litres. On ascending, it reaches a place where temperture is $-23^\circ C$ and pressure is 0.5 atm. The volume of the balloon is

A. 24000 litres

B. 20000 litres

C. 10000 litres

D. 12000 litres

Answer: B

Watch Video Solution

8. Equal weights of two gases of molecular weight 4 and 40 are mixed. The pressure of the mixture is 1.1 atm. The partial pressure of the light gas in this mixture is

A. 0.55 atm

B. 0.11 atm

C. 1 atm

D. 0.12 atm

Answer: C

 Watch Video Solution

9. A bottle of cold drink has 200 mL liquid in which CO_2 is 0.1 molar. If CO_2 behaves as ideal gas the volume of CO_2 at S.T.P. solution of cold drink is

A. 0.224 litre

B. 0.448 litre

C. 22.4 litre

D. 2.24 litre

Answer: B

Watch Video Solution

10. The vapour density of a gas (X) is 11.2. The volume occupied by 11.2 g of this gas at N.T.P. is

A. 1L

B. 11.2L

C. 22.4 litre

D. 20 L

Answer: B

Watch Video Solution

11. Select one correct statement. In the gas equation, $PV = nRT$

A. n is the number of molecules of a gas

B. V denotes of one mole of the gas

C. n moles of the gas have a volume V

D. P is the pressure of the gas when only one mole of gas is present

Answer: C

Watch Video Solution

12. The correct value of the gas contant R is close to

A. 0.082 litre-atmosphere K

B. 0.082 litre-atmosphere $K^{-1}mol^{-1}$

C. 0.082 litre - atmosphere $\hat{}\ (-1) Kmol^{-1}$

D. 0.082 litre $\hat{}\ (-1)$ atmosphere $\hat{}\ (-1)$ K mol

Answer: B

 Watch Video Solution

13. One litre of a gas weights 2 g at 300 K and 1 atm pressure. If the pressure is made 0.75 atm at which of the following temperature will one litre of the same gas weight one gram ?

A. 450K

B. 600K

C. 800 K

D. 900 K

Answer: A

Watch Video Solution

14. The density of a gas at $27^\circ C$ and $1atm$ is d. Pressure remaining constant, at which of the following temperture will its density become $0.75d$?

A. $220^\circ C$

B. $30^\circ C$

C. 400 K

D. 300 K

Answer: C

Watch Video Solution

15. Under what conditions will a pure sample of an ideal gas not only exhibit a pressure of $1atm$ but also a concentration of $1mollitre^{-1}$

$[R = 0.082$ iltre atm $mol^{-1}K^{-1}]$

A. At STP

B. When $V = 22.4$ litres

C. When $T = 12K$

D. Impossible under any conditions

Answer: C

Watch Video Solution

16. At what temperature, the rate of effusion of N_2 would be 1.625 times that of SO_2 at $50^\circ C$?

A. 110 K

B. 173 K

C. 373 K

D. 273 K

Answer: C

Watch Video Solution

17. Which of the following gaseous mixture does not follow Dalton's law of partial pressure?

A. O_2 and CO_2

B. N_2 and O_2

C. Cl_2 and O_2

D. NH_3 and HCl

Answer: D

Watch Video Solution

18. The maximum number of molecules is present in :

A. 0.5g of H_2 gas

B. 10 g of O_2 gas

C. $15L$ of H_2 gas at STP

D. 5L of N_2 gas at STP

Answer: C

Watch Video Solution

19. The pressure exerted by $6.0g$ of methane gas in a $0.03m^3$ vessel at $129^\circ C$ is: (Atomic masses of

$C = 12.01, H = 1.01$ and $R = 8.314 JK^{-1}mol^{-1}$)

A. 215216 Pa

B. 13409 Pa

C. 41648 Pa

D. 31684 PA

Answer: C

Watch Video Solution

20. A gaseous mixture was prepared by taking equal moles of CO and N_2. If the total pressure of the

mixture was found to be 1 atomosphere, the partical pressure of the nitrogen (N_2) in the mixture is

A. 1 atm

B. 0.5 atm

C. 0.8 atm

D. 0.9 atm

Answer: B

Watch Video Solution

21. A bubble of air is underwater at temperature $15^\circ C$ and the pressure 1.5 bar. If the bubble rises to the

surface where the temperature is $25^{\circ}C$ and the pressure is 1.0 bar, what will happen to the volume of the bubble?

A. Volume will become smaller by a factor of 0.70

B. Volume will become greater by a factor of 2.5

C. Volume will become greater by a factor of 1.6

D. Volume will become greater by a factor of 1.1

Answer: C

Watch Video Solution

22. A certain gas takes three times as long to effuse out as helium. Its molar mass will be

A. 27u

B. 36u

C. 64u

D. 9u

Answer: B

 Watch Video Solution

23. Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature $27^\circ C$

in identical conditions. The ratio of the volume of gases $H_2 : O_2$: methane would be

A. $16:1:2$

B. $8:1:2$

C. $8:16:1$

D. $16:8:1$

Answer: A

Watch Video Solution

24. A gas such as carbon monoxide would be most likely to obey the ideal gas law at

A. High temperature and low pressures

B. Low temperature and high pressue

C. High temperature and high pressures

D. Low temperature and low pressures

Answer: A

Watch Video Solution

25. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape ?

A. $1/8$

B. $1/4$

C. $3/8$

D. $1/2$

Answer: A

Watch Video Solution

26. Dominance of strong repulsive forces among the molecules of the gas ($Z =$ compressibility factor)

A. Depends on Z and indicated by $Z = 1$

B. Depdens on Z are indicated by $Z > 1$

C. Depends on Z and indicated by $Z < 1$

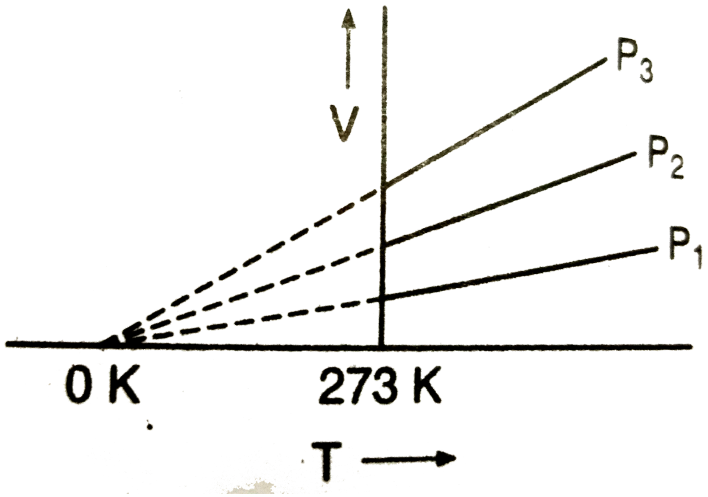
D. Is independent of Z

Answer: C

Watch Video Solution

27. The volume-temperature graphs of a given mass of an ideal gas at constant pressure are shown below.

What is the correct order of pressure ?



A. $P_1 > P_3 > P_2$

B. $P_1 > P_2 > P_3$

C. $P_2 > P_3 > P_1$

D. $P_2 > P_1 > P_3$

Answer: A

Watch Video Solution

28. Two separate bulbs contain ideal gas A and B. The density of a gas A is twice that of a gas B. The molecular mass of A is half that of gas B. The two gases are at the same temperature. The ratio of the pressure of A to that gas B is

A. 2

B. $1/2$

C. 4

D. $1/4$

Answer: C

Watch Video Solution

29. Densities of two gases are in the ratio $1:2$ and their temperatures are in the ratio $2:1$, then the ratio of their respective pressure is

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: A

Watch Video Solution

30. A certain sample of gas has a volume of 0.2 litre measured at $1atm$ pressure and $0^\circ C$. At the same pressure but at $273^\circ C$, its volume will be

A. 0.4 litres

B. 0.8 litres

C. 27.8 litres

D. 55.6 litres

Answer: A

Watch Video Solution

31. A vessel containing 5 litres of a gas at 0.8 m pressure is connected to an evacuated vessel of volume 3 litres. The resultant pressure inside with be (assuming whole system to be isolated)

A. 10.8 cm of Hg

B. 14.9 cm of Hg

C. 21.8 cm of Hg

D. 38.8 cm of Hg

Answer: A

 Watch Video Solution

32. If 4 g O_2 effuse through a very narrow hole , How much H_2 would have effused under identical conditions .

A. 16g

B. 1 g

C. $1/4$g

D. 64g

Answer: B

Watch Video Solution

33. One gram mole of a gas at NTP occupies 22.4 L. This fact is derived from

A. Datlton's theory

B. Avagadro['s hypothesis

C. Berzelius hypothesis

D. Law of gaseous volume

Answer: B

 Watch Video Solution

34. The ideal pressur exerted by a number of non-reacting gases is equal to the sum of the partial

pressures of the gases under the same conditions. This statement is according to :

A. Boyle's law

B. Charle' law

C. Avogadro's law

D. Dalton's law

Answer: D

Watch Video Solution

35. If $20cm^3$ gas at $1atm$ is expanded to $50cm^3$ at constant T, then what is the final pressure

A. $20 \times \frac{1}{50}$

B. $50 \times \frac{1}{20}$

C. $1 \times \frac{1}{20} \times 50$

D. None of these

Answer: A

Watch Video Solution

36. Pure hydrogen sulphide is stored in a tank of 100 litre capacity at 20°C and 2 atm pressure. The mass of the gas will be

A. 34g

B. 340 g

C. 282.4 g

D. 28.24g

Answer: C

Watch Video Solution

37. Which of the following gas will have highest rate of diffusion ?

A. NH_3

B. N_2

C. CO_2

D. O_2

Answer: A

Watch Video Solution

38. At N.T.P. the volume of a gas is found to be 273 ml. What will be the volume of this gas at 600 mm Hg and $273^\circ C$?

A. 391.8 ml

B. 380 ml

C. 691.6 ml

D. 750 ml

Answer: C

Watch Video Solution

39. A gas diffuse $\frac{1}{5}$ times as fast as hydrogen at same pressure. Its molecular weight is

A. 50

B. 25

C. $25\sqrt{2}$

D. $50\sqrt{2}$

Answer: A

Watch Video Solution

40. The densities of two gases are in the ratio of $1:16$. The ratio of their rates of diffusion is

A. $16:1$

B. $4:1$

C. $1:4$

D. $1:16$

Answer: B

Watch Video Solution

41. Containers A and B have same gases. Pressure, volume and temperature of A are all twice that of B, then the ratio of number of molecules of A and B are

A. $1:2$

B. 2

C. $1:4$

D. 4

Answer: B

Watch Video Solution

42. A gaseous mixture contains oxygen and nitrogen in the ratio of $1:4$ by weight therefore the ratio of their number of molecules is

A. $1:8$

B. $1:4$

C. $3:16$

D. $7:32$

Answer: D

Watch Video Solution

43. What will be the partial pressures of He and O_2 respectively if 200 ml of He at 0.66 atm pressure and 400 ml of O_2 at 0.52 atm pressure are mixed in 400 ml vessel at $20^\circ C$?

A. 0.33 and 0.56

B. 0.33 and 0.52

C. 0.38 and 0.52

D. 0.25 and 0.45

Answer: B

Watch Video Solution

44. 4.4 g of a gas at STP occupies a volume of 2.24 L. The gas can be :

A. O_2 and CO_2

B. CO

C. NO_2

D. CO_2

Answer: D

Watch Video Solution

45. At STP 1g $CaCO_3$ on decomposition gives CO_2

A. 22.4 litres

B. 2.24 litres

C. 0.224 litre

D. 11.2 litres

Answer: C

Watch Video Solution

46. If the average velocity of N_2 molecules is $0.3ms^{-1}at27^{\circ}C$, then the velocity of $0.6ms^{-1}$ will take place at

A. 1200 K

B. 600K

C. 400 K

D. 1800 K

Answer: A

Watch Video Solution

47. When a jar containing gaseous mixture of equal volumes of CO_2 and H_2 is placed in a solution of sodium hydroxide, the solution level will

A. Rise

B. Fall

C. Remain constant

D. Become zero

Answer: A

Watch Video Solution

48. At 1 atm and 273 K the density of gas, whose molecular weight is 45, is:

A. $44.8gm$ / litre

B. 11.4 gm / litre

C. 2 gm / litre

D. 3 gm / litre

Answer: C

Watch Video Solution

49. Which of the following gaseous mixture does not follow Dalton's law of partial pressure?

A. SO_2 and Cl_2

B. CO_2 and N_2

C. CO and CO_2

D. CO and N_2

Answer: A

Watch Video Solution

50. What is the ratio of diffusion rate of oxygen to hydrogen?

A. $1:4$

B. $4:1$

C. $1:8$

D. $8:1$

Answer: A

Watch Video Solution

51. 1 L oxygen gas at STP will weigh

A. $1.43g$

B. 2.24 g

C. 11.2 g

D. 22.4g

Answer: A

Watch Video Solution

52. Use of hot air ballons in sports and meteorological observations in an application of

A. Boyle's law

B. Newtonic law

C. Kelvin's law

D. Charle's law

Answer: D

Watch Video Solution

53. N_2 is found in a litre flask under $100kPa$ pressure and O_2 is found in another $3litre$ flask under $20KPa$ pressure. If the two flask are connected, the resultant pressure is

A. 310 kPa

B. 210 kPa

C. 420 kPa

D. 265kPa

Answer: D

Watch Video Solution

54. Equal volumes of gases at the same temperature and pressure contain equal number of particles. This statement is a direct consequence of

A. Avogadro's law

B. Charle' law

C. Ideal gas equation

D. Law of partial pressure

Answer: A

Watch Video Solution

55. A mixture of NO_2 and N_2O_4 has a vapor density of 38.3 at 300 K. What is the number of moles of NO_2 in 100 g of themixture ?

A. 0.043

B. 4.4

C. 3.4

D. 0.437

Answer: D

Watch Video Solution

56. Which of the following pairs will effuse at the same rate through a porous plug .

A. CO, NO_2

B. NO_2, CO_2

C. NH_3, PH_3

D. NO, C_2H_6

Answer: D

Watch Video Solution

57. Two gases bulbs A and B are connected by a tube having a stopcock. Bulb A has a volume of $100mL$ and contains H_2 gas . After opening the gas from A to the evacuated bulb B , the pressure falls down by $40\,\%$. The volume $(mL)of$B` must be

A. 75

B. 150

C. 125

D. 200

Answer: B

Watch Video Solution

58. A $4.0dm^3$ flask containing N_2at4 bar was connected to a $6.0dm^3$ flask containing helium at 6 bar , and the gases were allowed to mix isothermally. The total pressure of the resulting mixture will be

A. 10.0 bar

B. 5.2 bar

C. 3.6 bar

D. 1.6 bar

Answer: B

Watch Video Solution

59. 56 g of nitrogen and 96 g of oxygen are mixed isothermally and at a total pressure of 10 atm. The partial pressures of oxygen and nitrogen (in atm) are respectively

A. 4,6

B. 5,5

C. 2,8

D. 6,4

Answer: D

Watch Video Solution

60. At what pressure a quantity of gas will occupy a volume of 60 mL, if it occupies a volume of 100mL at a pressure of 720 mm (while temperature is constant) :

A. 736.8 mm

B. 820.20 mm

C. 784.15 mm

D. 857.14mm

Answer: D

Watch Video Solution

61. The molecular weight of a gas which diffuses through a porous plug at $1/6^{th}$ of the speed of hydrogen under identical condition is:

A. 27

B. 72

C. 36

D. 48

Answer: B

Watch Video Solution

62. Molecular weight of a gas that diffuses twice as rapidly as the gas with molecular weight 64 is

A. 16

B. 8

C. 64

D. 6.4

Answer: A

Watch Video Solution

63. Steam distillation is based on

A. Boyle's law

B. Charle' law

C. Dalton's law of partial pressure

D. Avogadro's law

Answer: C

Watch Video Solution

64. A closed vessel contains equal number of nitrogen and oxygen molecules at pressure of Pmm. If nitrogen is removed from the system, then the pressure will be:

A. P

B. 2P

C. $P/2$

D. P^2

Answer: C

Watch Video Solution

65. In the corrections made to the ideal gas equation for real gases, the reduction in pressure due to attractive forces is directly proportional to :

A. n/V

B. nb

C. $n^2 / V^2 b$

D. n^2 / V^2

Answer: D

Watch Video Solution

66. Volume occupied by an ideal gas at one atmospheric pressure and $0^\circ C$ is V ml. Its volume at 273 K will be

A. V ml

B. $V / 2$ ml

C. 2V

D. None of these

Answer: A

Watch Video Solution

67. The densities of hydrogen and oxygen are 0.09 and 1.44 g L^{-1}. If the rate of diffusion of hydrogen is 1 then that of oxygen in the same units will be

A. 4

B. $1/4$

C. 16

D. $1/16$

Answer: B

Watch Video Solution

68. Gaseous mixture of contains 56 g of N_2 , 44g of CO_2 and 16 g of CH_4 . The total pressure of mixture is 720 mm of Hg . The partial pressure of CH_4 is :-

A. 75 atm

B. 160 atm

C. 180 atm

D. 215 atm

Answer: C

Watch Video Solution

69. For an ideal gas, number of moles per litre in terms of its pressure P, gas constant R and temperature T is

A. PT/R

B. PRT

C. P/RT

D. RT/P

Answer: C

Watch Video Solution

70. An ideal gas is allowed to expand both reversible and irreversibly in an isolated system. If T_i is the initial

temperature and T_f is the final temperature, which of the following statements is correct:

A. $(T_f)_{\text{irrev}} > (T_f)_{rev}$

B. $T_f > T_i$ for reversible process but $T_f = T_i$ for irreversible process

C. $(T_f)_{\text{rev}} = (T_f)_{\text{irrev}}$

D. $T_f = T_i$ for both reversible and irreversible processes

Answer: A

 Watch Video Solution

71. If $10^{-4}dm^3$ of water is introduced into a $1.0dm^3$ flask to $300K$ how many moles of water are in the vapour phase when equilibrium is established ? (Given vapour pressure of H_2O at $300K$ is $3170PaR = 8.314JK^{-1}mol^{-1}$) .

A. $1.27 \times 10^{-3}mol$

B. 5.56×10^{-3} mol

C. 1.53×10^{-2} mol

D. 4.46×10^{-2} mol

Answer: A

Watch Video Solution

72. Equal masses of methane and oxygen are mixed in an empty container at $25^{\circ}C$. The fraction of the total pressure exerted by oxygen is:

A. $\frac{2}{3}$

B. $\frac{1}{3} \times \frac{273}{298}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

Answer: C

Watch Video Solution

73. For the gaseous reaction: $N_2O_4 \rightarrow 2NO_2$

A. Remains constant

B. Decreases

C. Increases

D. Becomes zero

Answer: C

Watch Video Solution

74. Five grams each of the following gases at $87^{\circ} C$ and 750 mm pressure are taken. Which of them will have the least volume ?

A. HF

B. HCl

C. HBr

D. HI

Answer: D

Watch Video Solution

75. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is

A. 64.0

B. 32.0

C. 40.0

D. 80.0

Answer: A

Watch Video Solution

76. There are 6.02×10^{22} molecules each of N_2, O_2 and H_2 which are mixed together at $760mm$ and $273K$. The mass of the mixture in grams is :

A. 6.2

B. 4.12

C. 3.09

D. 7

Answer: A

Watch Video Solution

77. A gas occupies a volume of 300 cm^3 at $27^\circ C$ and 620 mmHg pressure . The volume of gas at $47^\circ C$ and 640 mmHg pressure is

A. 400 c.c.

B. 510 c.c.

C. 310 c.c.

D. 350 c.c.

Answer: C

Watch Video Solution

78. A,B and C are ideal gases. Their molecular weights are 2,4 and 28 respectively. The rate of diffusion of these gases follow the order

A. $C > A > B$

B. $C > B > A$

C. $A = B = C$

D. $A > B > C$

Answer: D

Watch Video Solution

79. The dimensions of universal gas constant is

A. $\left[VPT^{-1}n^{-1}\right]$

B. $\left[VP^{-1}Tn^{-1}\right]$

C. $\left[VPTn^{-1}\right]$

D. $\left[VPT^{-1}n\right]$

Answer: A

Watch Video Solution

80. At $0^{\circ} C$ and one atm pressure, a gas occupies 100 cc. If the pressure is increased to one and a half-time and temprature is increased by one-third of absolute temperature, then final volume of the gas will be:

A. 80 cc

B. 88.9 cc

C. 66.7 cc

D. 100 cc

Answer: B

Watch Video Solution

81. 500mL of NH_3 contains 6.02×10^{23} molecules at STP. How many molecules are present in 100 mL of CO_2 at STP?

A. 6×10^{23}

B. 1.5×10^{23}

C. 1.2×10^{23}

D. None of these

Answer: C

Watch Video Solution

82. The density of O_2 is 16 at STP. At what temperature (in $.^\circ C$) its density will be 14 ? Consider that the pressure remais constant.

A. 50° C

B. 39° C

C. $57^\circ C$

D. $43^\circ C$

Answer: B

Watch Video Solution

83. The pressure and temperature of $4dm^3$ of carbon dioxide gas are doubled. Then the volume of carbon dioxide gas would be

A. $2dm^3$

B. $3dm^3$

C. $4dm^3$

D. $8dm^3$

Answer: C

Watch Video Solution

84. Hydrogen diffuses six times faster than gas A. The molar mass of gas A is

A. 72

B. 6

C. 24

D. 36

Answer: A

Watch Video Solution

85. In the equation of state of an ideal gas `PV = nRT, the value of universal gas constant would depend only on :

A. The nature of the gas

B. The pressure of the gas

C. The units of the measurement

D. None of these

Answer: C

Watch Video Solution

86. The density of a gas is $1.964 g 1 dm^{-3} at 273 K$ and $76 cm Hg$. The gas is

A. CH_4

B. C_2H_6

C. CO_2

D. Xe

Answer: C

Watch Video Solution

87. In order to increase the volume of a gas by 10% , the pressure of the gas should be

A. Decreased by 10%

B. Decreased by 1%

C. Increased by 10%

D. Increased by 1%

Answer: A

Watch Video Solution

88. $0.5mol$ of H_2, SO_2, and CH_4 is kept in a container. A hole was made in the container. After $3hours$, the order of partial pressure in the container will be

A. $pSO_2 > pCH_4 > pH_2$

B. $pH_2 > pSO_2 > pCH_4$

C. $pH_2 > pCH_4 > pSO_2$

D. $pSO_2 > pH_2 > pCH_4$

Answer: A

Watch Video Solution

89. In which one of the following, does the given amount of chlorine exert the least pressure in a vessel of capacity 1 d m^3 at 273 K ?

A. $0.0355g$

B. $0.071g$

C. 6.023×10^{21} molecules

D. 0.02 mole

Answer: A

Watch Video Solution

90. For an ideal gas :

A. $\left(\frac{\partial E}{\partial V}\right)_T > 0$

B. $\left(\frac{\partial P}{\partial V}\right)_T = 0$

C. $\left(\frac{\partial E}{\partial V}\right)_T = 0$

D. $\left(\frac{\partial (PV)}{\partial V}\right)_T > 0$

Answer: C

Watch Video Solution

91. समीकरण $C_P - C_V = R,$ में R का अर्थ होता है :

A. Work done per mole per Kelvin

B. Heat absorbed per mole per Kelvin

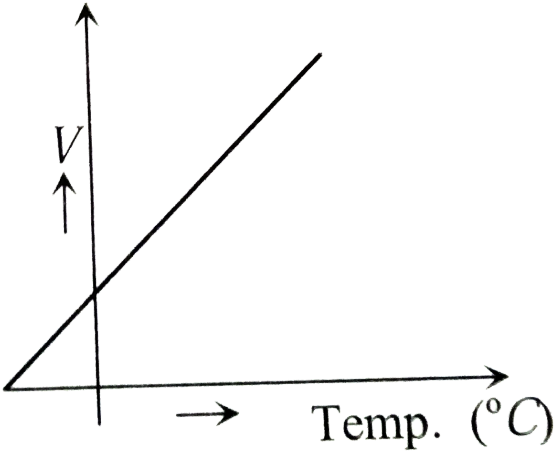
C. Heat released per mole per Kelvin

D. Work done per mole per degree celcius

Answer: A

Watch Video Solution

92. The following graph illustrates



A. Dalton's law

B. Charle' law

C. Boyle's law

D. Gau-Lussac's law

Answer: B

Watch Video Solution

93. If a mixture of CO and N_2 in equal amount have total 1 atm pressure, then partial pressure of N_2 in the mixture is

A. 1 atm

B. 0.50 atm

C. 2 atm

D. 3 atm

Answer: B

Watch Video Solution

94. If two molecules of A and B having mass 100 amu and 64 amu respectively and rate of diffusion of A is 12×10^{-3}, then what will be the rate of diffusion of B?

A. 15×10^{-3}

B. 64×10^{-3}

C. 5×10^{-3}

D. 46×10^{-3}

Answer: A

Watch Video Solution

95. Rate of diffusion of NH_3 is twice that of X. What is the molecular mass of X

A. 68

B. 48

C. 12

D. 8

Answer: A

Watch Video Solution

96. If two mole of an ideal gas at $546K$ occupies a volume of $44.8litres$, the pressure must be :

A. 2 atm

B. 3 atm

C. 4 atm

D. 1 atm

Answer: A

Watch Video Solution

97. What is the density of N_2 gas at $227^\circ C$ and $5.00atm$ pressure? $\left(R = 0.0821atmK^{-1}mol^{-1}\right)$

A. $1.40g/mL$

B. $2.81g/mL$

C. $3.41g/mL$

D. $0.29g/mL$

Answer: C

Watch Video Solution

98. If $P, V,$ and T represent pressure, volume and temperature of the gas, the correct representation of Boyle's law is

A. $V \propto \frac{1}{T}$ (at constant P)

B. $PV = RT$

C. $V \propto 1/P$ (at constant T)

D. $PV = nRT$

Answer: C

Watch Video Solution

99. Air at sea level is dense. This is a practical application of

A. Boyle's law

B. Charle' law

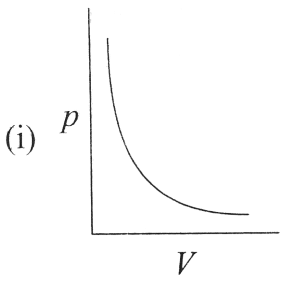
C. Avagadro's law

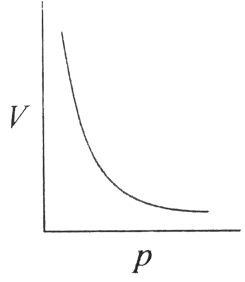
D. Dalton's law

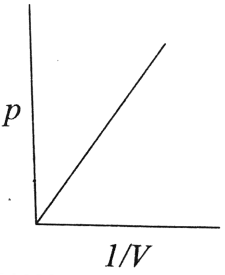
Answer: A

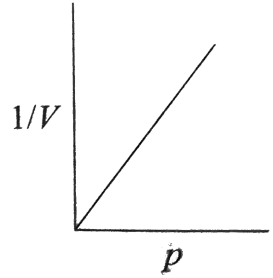
Watch Video Solution

100. Which of the following graphs represents Boyle's law correctly?

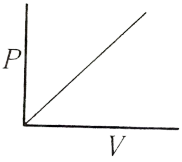
(i) 

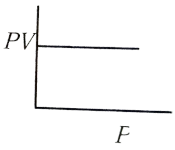
(ii) 

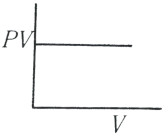
(iii) 

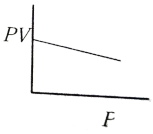
(iv) 

(i)

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: BC

Watch Video Solution

101. Which one fo the following statements is false

A. Avagadro number $= 6.02 \times 10^{21}$

B. The relationship between average velocity $(\bar{v})$ and root mean square velocity (u) is $\bar{v} = 0.9213u$

C. The mean kinetic energy of an ideal gas is independent of the pressure of the gas

D. The root mean square velocity of the gas can be calculated by the formula $(3RT/M)^{1/2}$

Answer: A

Watch Video Solution

102. 32 g of oxygen and 3.0 g of hydrogen are mixed and kept in a vessel at 760 mm pressure and $0^{\circ}C$. The total volume occupied by the mixture will be nearly

A. 22.4 litres

B. 33.6 litres

C. 448 litres

D. 44800 ml

Answer: D

Watch Video Solution

103. A sample of gas occupies $100mL$ at $27^\circ C$ and $740mm$ pressure. When its volume is changed to $80mL$ at $740mm$ pressure, the temperature of the gas will be

A. $21.6^\circ C$

B. $240^\circ C$

C. $-33^\circ C$

D. $89.5^\circ C$

Answer: C

Watch Video Solution

104. Atmolysis is a process of

A. Atomising gas molecules

B. The breaking of atoms to sub-atomic particles

C. Separation of gases from their gaseous mixture

D. Changing of liquids to their vapour state

Answer: C

Watch Video Solution

105. If the absolute temperature of an ideal gas become double and pressure become half , the volume of gas would be

A. Remain unchange

B. Will be double

C. Will be four times

D. Will be half

Answer: B

Watch Video Solution

106. Initial temperature of an ideal gas is $75^{\circ}C$. At what temperature, the sample of neon gas would be heated to double its pressure, if the initial volume of gas is reduced by 15%?

A. $319^\circ C$

B. $592^\circ C$

C. $128^\circ C$

D. $60^\circ C$

Answer: A

Watch Video Solution

107. A and B are ideal gases. The molecular weights of A and B are in the ratio of $1:4$. The pressure of a gas mixture containing equal weights of A and B is P atm. What is the partial pressure (in atm.) of B in the mixture

A. $\frac{P}{5}$

B. $\frac{P}{2}$

C. $\frac{P}{2.5}$

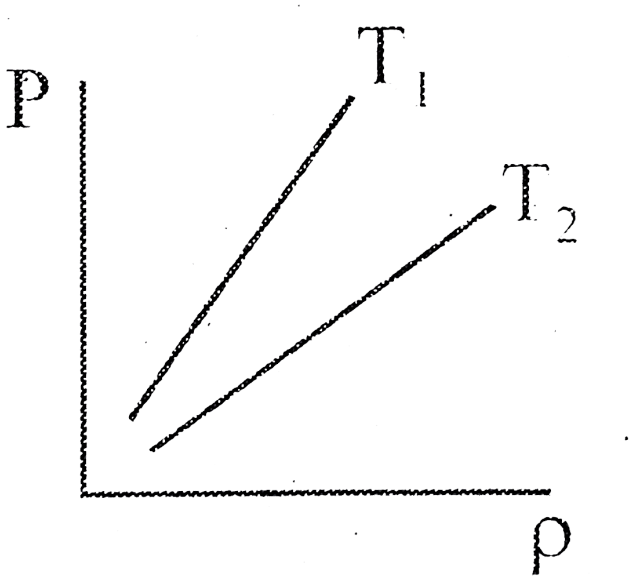
D. $\frac{3P}{4}$

Answer: A

Watch Video Solution

108. Figure shows graphs of pressure vs density for an ideal gas at two temperature T_1 and T_2 . Which of the

following is correct ?



A. $T_1 > T_2$

B. $T_1 < T_2$

C. $T_1 = T_2$

D. Cannot be said

Answer: A

Watch Video Solution

109. A pre weighed vessel was filled with oxygen at N.T.P. and weighted.It was then evacuated, filled with SO_2 at the same temperature and pressure, and again weighed. The weight of oxygen will be

A. The same as that of SO_{20}

B. $\frac{1}{2}$ that of SO_2

C. Twice that of SO_2

D. One fourth that of SO_2

Answer: B

Watch Video Solution

110. Assertion:Pressure is exerted by gas in a container with increasing temperature of the gas.

Reason: With the rise in temperature, the average speed of gas molecules increases.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

Watch Video Solution

111. Assertion: Compressibility factor for hydrogen varies with pressure with positive slope at all pressures.

Reason: Even at low pressures, repulsive forces dominate hydrogen gas.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

Watch Video Solution

112. A : At high pressure , the compressibility factor Z is $\left(1+\frac{pb}{RT}\right)$.

R : At high pressure van der Wall's equation is modified as p(V - b) = RT` .

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

Watch Video Solution

113. STATEMENT-1 : $1/4^{th}$ of the initial mole of the air is expelled, if air present in an open vessel is heated from $27^{\circ}C$ to $127^{\circ}C$.

STATEMENT-2 : Rate of diffusion of a gas is inversely proportional to the square root of its molecular mass.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: B

Watch Video Solution

114. A 20 litre container at $400K$ contains $CO_2(g)$ at pressure $0.4atm$ and an excess of SrO (neglect the

volume of solid SrO). The volume of the container, when pressure of CO_2 attains its maximum value, will be:

(Given that: $SrCO_3(s) \Leftrightarrow SrO(s) + CO_2(g) K_p = 1.6atm$)

A. 10 litre

B. 4 litres

C. 2 litre

D. 5 litre

Answer: D

Watch Video Solution

Ordinary Thinking Objective Questions Kinetic Theory Of Gases And Molecular Collisions

1. The density of a gas A is three times that of a gas B. It the molecular mass of A is M, the molecular mass of B is

A. 3M

B. $\sqrt{3}M$

C. $M/3$

D. $M/\sqrt{3}$

Answer: C

Watch Video Solution

2. Ratio of C_p and C_v of a gas $'X'is1.4$. The number of atoms of the gas $'X'$ presents in 11.2litres of it a NTP is

A. 6.02×10^{23}

B. 1.2×10^{24}

C. 3.01×10^{23}

D. 2.01×10^{23}

Answer: A

Watch Video Solution

3. The density of neon will be highest at

A. S.T.P.

B. $0^{\circ}C,$ 2 atm

C. $273^{\circ}C$, 1 atm

D. $273^{\circ}C$, 2 atm

Answer: B

Watch Video Solution

4. Absolute zero is defined as the temperture

A. At which all molecular motion ceases

B. At which liquid helium boils

C. At which ether boils

D. All of the above

Answer: A

Watch Video Solution

5. Internal energy and pressure of a gas per unit vloume are related as :

A. $P = \frac{2}{3}E$

B. $P = \frac{3}{2}E$

C. $P = \frac{1}{2}E$

D. $P = 2E$

Answer: A

Watch Video Solution

6. At STP, 0.50 mole H_2 gas and 1.0 mole He gas

A. Have equal average kinetic energies

B. Have equal molecular speeds

C. Occupy equal volumes

D. Have equal effusion rates

Answer: A

Watch Video Solution

7. Equal volume of two gases which do not react together are enclosed in separate vessels. Their pressures are 10mm and 400mm respectively. If the two vessels are joined together, then what will be the pressure of the resulting mixture (temperature remaining constant)?

A. 125 mm

B. 500 mm

C. 1000 mm

D. 250 mm

Answer: D

Watch Video Solution

8. If a gas expands at constant temperature, it indicates that

A. Kinetic energy of molecules remains the same

B. Number of the molecules of gas increases

C. Kinetic energy of molecules decreases

D. Pressure of the gas increase

Answer: A

Watch Video Solution

9. Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molar mass of A is $49u$. Molar mass of B will be

A. 25.00 u

B. 50.00 u

C. $12.25u$

D. 6.50u

Answer: C

Watch Video Solution

10. Which of the following expressions correctly represents the relationship between the average molar kinetic energies (KE) of CO and N_2 molecules at the same temperature?

A. $\overline{\overline{KE}}_{CO} = \overline{\overline{KE}}_{N_2}$

B. $\overline{\overline{KE}}_{CO} > \overline{\overline{KE}}_{N_2}$

C. $\overline{\overline{KE}}_{CO} < \overline{\overline{KE}}_{N_2}$

D. Cannot be predicted unless the volumes of the gases are given

Answer: A

Watch Video Solution

11. The density of air is $0.00130 g/ml$. The vapour density of air will be

A. 0.00065

B. 0.65

C. 14.4816

D. 14.56

Answer: D

Watch Video Solution

12. An ideal gas will have maximum density when

A. $P = 0.5atm, T = 600K$

B. $P = 2$ at, T $= 150K$

C. $P = 1$ atm, $T = 300K$

D. $P = 1.0$ atm, $T = 500K$

Answer: B

Watch Video Solution

13. The ratio $\gamma\left(\frac{C_P}{C_V}\right)$ for iner gases is

A. 1.33

B. 1.66

C. 2.13

D. 1.99

Answer: B

Watch Video Solution

14. Vibrational energy is

A. Partially potential and partially kinetic

B. Only potenital

C. Only kinetic

D. None of the above

Answer: A

Watch Video Solution

15. Three different gases X, Y and Z of molecular masses 2, 16 and 64 were enclosed in a vessel at constant temperature till equilbrium is reaches. Which of the following statement is correct?

A. Gas Z will be at the top of the vessel

B. Gas Y will be at the top of the vessel

C. Gas Z will be at the bottom and X will be at the top

D. Gases will form homogenous mixture

Answer: d

Watch Video Solution

16. Which of the following represents total kinetic energy of one mole of gas?

A. $1/2RT$

B. $3/2RT$

C. $(C_P - C_V)RT$

D. $2/3RT$

Answer: B

Watch Video Solution

17. The average K.E. of an ideal gas is calories per mole is approximately equal to

A. Three times the absolute temperature

B. Absolute temperature

C. Two times the absolute temperature

D. 1.5 times the absolute temperature

Answer: A

Watch Video Solution

18. The average kinetic energy of one molecule of an ideal gas at $27^{\circ}C$ and 1 atm pressure is [Avogadro

number $N_A = 6.023 \times 10^{23}$]

A. $900 cal K^{-1}$ molecule $\hat{}\ (-1)$

B. $6.21 \times 10^{-21} JK^{-1}$ molecule $\hat{}\ (-1)$

C. $336.7 JK^{-1}$ molecule $\hat{}\ (-1)$

D. $3741.3 jk^{-1} \text{molecule}^{-1}$

Answer: B

Watch Video Solution

19. According to kinetic theory of gases, for a diatomic molecule

A. The pressure exerted by the gas is proportional to the mean velocity of the molecules

B. The pressure exerted by the gas is proportional to the root mean square velocity of the molecules

C. The root mean square velocity is inversely proportional to the temperature

D. The mean translational kinetic energy of the molecules is proportional to the absolute temperature.

Answer: D

Watch Video Solution

20. At the same temperature and pressure, which of the following will have highest KE per mole

A. Hydrogen

B. Oxygen

C. Methane

D. All the same

Answer: D

Watch Video Solution

21. What is kinetic energy of 1 gm of O_2 at $47^\circ C$?

A. $1.24 \times 10^2 J$

B. $2.24 \times 10^2 J$

C. $1.24 \times 10^3 J$

D. $3.24 \times 10^2 J$

Answer: A

Watch Video Solution

22. Different gases at the same temperature must have

A. Same volume

B. Same pressure

C. Same average KE

D. Same vander Wall's constant

Answer: C

Watch Video Solution

23. Internal energy of an ideal gas depends upon

A. Pressure

B. Force

C. Temperature

D. Molar mass

Answer: C

Watch Video Solution

24. Indicate the correct statement for equal volumes of $N_2(g)$ and $CO_2(g)$ at $25^\circ C$ and 1 atm.

A. The average translational KE per molecule is the same in N_2 and CO_2

B. The rms speed remains constant for both N_2 and CO_2

C. The density of N_2 is less than that of CO_2

D. The total translational KE of both N_2 and CO_2 is the same

Answer: ACD

Watch Video Solution

25. If the inversion temperature of a gas is $-80^{\circ}C$, then it will produce cooling under Joule-Thomson effect at

A. 298K

B. 273K

C. 193K

D. 173K

Answer: D

Watch Video Solution

26. $2mol\ He$ is mixed with $2gm$ of H_2. The molar heat capacity at constant pressure for the mixture is

A. $\frac{17}{6}R$

B. $\frac{11}{6}r$

C. $4R$

D. $\frac{3R}{2}$

Answer: A

Watch Video Solution

27. Assertion: Gases do not settle at the bottom of container.

Reason: Gases have high kinetic energy.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: A

Watch Video Solution

28. Assertion: A mixture of He and O_2 is used for respiration for deep sea divers.

Reason: He is soluble in blood.

A. If both assertion and reason are true and the reason is correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false

Answer: C

Watch Video Solution

Ordinary Thinking Objective Questions Molecular Speeds

1. Root mean square velocity of a gas molecule is proprotional to

A. $m^{1/2}$

B. m^{0}

C. $m^{-1/2}$

D. m

Answer: C

Watch Video Solution

2. The ratio among most probable velocity, mean velocity and root mean velocity is given by

A. $1:2:3$

B. $1\sqrt{2}:\sqrt{3}$

C. $\sqrt{2}:\sqrt{3}:\sqrt{8/\pi}$

D. $\sqrt{2}:\sqrt{8/\pi}:\sqrt{3}$

Answer: D

Watch Video Solution

3. The temperature of the gas is raised from $27^{\circ}C$ to $927^{\circ}C$, the root mean square velocity is

A. $\sqrt{927/27}$ times the earlier value

B. Same as before

C. Halved

D. Doubled

Answer: D

Watch Video Solution

4. The average kinetic energy of an ideal gas per molecule in SI units at $25^{\circ}C$ will be

A. $6.17 \times 10^{-21} Kj$

B. $6.17 \times 10^{-21} J$

C. $6.17 \times 10^{-20} J$

D. $6.17 \times 10^{-20} J$

Answer: B

Watch Video Solution

5. At what temperature is the average velocity of O_2 molecule equal to the root mean square velocity at $27^\circ C$?

A. $80.57^\circ C$

B. $80^\circ C$

C. $83^\circ C$

D. $86.5^{\circ} C$

Answer: A

Watch Video Solution

6. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?

A. 1.4

B. 2.0

C. 2.8

D. 4.0

Answer: A

Watch Video Solution

7. The root mean square velocity of an ideal gas in a closed container of fixed volume is increased from $5 \times 10^4 cms^{-1}$ to $10 \times 10^4 cms^{-1}$. Which of the following statements correctly explains how the change is accomplished?

A. By heating the gas, the temperature is doubled

B. By heating the gas, the pressure is quadrupled (i.e., made four times)

C. By heating the gas, the temperature is quadrupled

D. By heating the gas, the pressure is doubled.

Answer: C

Watch Video Solution

8. Root mean square velocity of a particle is v at pressure P. If pressure is increased two times, then the r.m.s. velocity becomes

A. 1200K

B. 900K

C. 600K

D. 150 K

Answer: A

Watch Video Solution

9. If the v_{rms} is $30R^{1/2}$ at $27^{\circ}C$ then calculate the molar mass of gas in kilogram.

A. 1

B. 2

C. 4

D. 0.001

Answer: D

Watch Video Solution

10. The rms speed at NTP of a gas can be calculated from the expression:

A. $\sqrt{\frac{3P}{d}}$

B. $\sqrt{\frac{3PV}{M}}$

C. $\sqrt{\frac{3RT}{M}}$

D. All the above

Answer: D

Watch Video Solution

11. At $27^\circ C$, the ratio of rms speed of ozone to that of oxygen is :

A. $\sqrt{3/5}$

B. $\sqrt{4/3}$

C. $\sqrt{2/3}$

D. 0.25

Answer: C

Watch Video Solution

12. Which one of the following statement is not true about the effect of an increase in temperature on the distribution of molecular speed of gas ? .

A. The most probable speed increases

B. The fraction of the molecules with the most probable speed increases

C. The distribution becomes broader

D. The area under the distribution curve remaiins the same as under the lower temperature

Answer: B

Watch Video Solution

13. In two vessels of 1 litre each at athe same temperature 1g of H_2 and 1g of CH_4 are taken. For these gases:

A. V_{rms} values will be same

B. Kinetic energy per mol will be same

C. Total kinetic energy will same

D. Pressure will be same

Answer: B

Watch Video Solution

14. At what temperature will the rms velocity of SO_2 be the same as that of $O_2 at 303K$?

A. $273K$

B. 606K

C. 303K

D. 403K

Answer: B

Watch Video Solution

15. The rms velocity molecules of a gas of density $4kgm^{-3}$ and pressure $1.2 \times 10^5 Nm^{-2}$ is

A. $900ms^{-1}$

B. $120ms^{-1}$

C. $600ms^{-1}$

D. $1300ms^{-1}$

Answer: D

Watch Video Solution

16. For one mole of an ideal gas, increasing the temperature from $10^{\circ}C$ to $20^{\circ}C$

A. Increases the average kinetic energy by two times

B. Increases the rms velocity by $\sqrt{2}$ times

C. Increase the rms velocity by two times

D. Increase both the average kinetic energy and rms velocity, but not significantly.

Answer: D

Watch Video Solution

17. The ratio of most probable velocity to that of average velocity is

A. $\pi / 2$

B. $2 / \pi$

C. $\sqrt{\pi} / 2$

D. $2/\sqrt{\pi}$

Answer: C

Watch Video Solution

18. The ratio of most probable velocity to that of average velocity is

A. 1.128

B. 1.224

C. 1.0

D. 1.112

Answer: A

Watch Video Solution

19. At what temperature, the r.m.s. velocity of a gas measured at $50^\circ C$ will become double ?

A. 626K

B. 1019K

C. $200^\circ C$

D. $1019^\circ C$

Answer: D

Watch Video Solution

20. The root mean square velocity of hydrogen molecules at 300 K is $1930ms^{-1}$. The rms velocity of oxygen molecules at 1200 K will be

A. $7.6 \times 10^3 m/\text{sec}$

B. $3.8 \times 10^3 m/\text{sec}$

C. $0.95 \times 10^3 m/\text{sec}$

D. $0.475 \times 10^{30m/}\text{sec}$

Answer: C

Watch Video Solution

21. In the temperature changes from $27^{\circ}C$ to $127^{\circ}C$, the relative percentage change in RMS velocity is

A. 1.56

B. 2.56

C. 15.6

D. 82.4

Answer: C

Watch Video Solution

22. Which of the following has maximum root mean square velocity at the same temperature ?

A. SO_2

B. CO_2

C. O_2

D. H_2

Answer: D

Watch Video Solution

23. A temperature at which rms speed of SO_2 molecule is half of that of helium molecules at $300K$

A. 150 K

B. 600 K

C. 900 K

D. 1200K

Answer: D

Watch Video Solution

24. The rms speed of N_2 molecules in a gas in u. If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atom, the rms speed becomes

A. $u/2$

B. 2u

C. 4u

D. 14u

Answer: B

Watch Video Solution

Ordinary Thinking Objective Questions Real Gases And Vander Waals Equation

1. When is deviation more in the behaviour of a gas from the ideal gas equation $PV = nRT$?

A. At high temperature and low pressure

B. At low temperature and high pressure

C. At high temperature and high pressure

D. At low temperature and low pressure

Answer: B

2. van der Waal's equation reduces itself to the ideal gas equation at

A. High pressure and low temperature

B. Low pressure and low temperature

C. Low pressure and high temperature

D. High pressure and high temperature

Answer: C

Watch Video Solution

3. For real gases, van der Waals' equation is written as

$$\left(P+\frac{an^2}{V^2}\right)(V-nb)=nRT$$

where a and b are van der Waals' constants.

Two sets of gases are:

$(I) O_2, CO_2, H_2$ and $He (II) CH_4, O_2$ and O_2 and H_2

The gases given in set I in increasing order of b and gases given in set II in decreasing order of a are arranged below. Select the correct order from the following:

A.

$(I) He < H_2 < CO_2 < O_2 \quad (II) CH_4 > H_2 > O_2$

B.

$(I) O_2 < He < H_2 < CO_2 \quad (II) H_2 > O_2 > CH_4$

C.

$(I) H_2 < He < O_2 < CO_2 \quad (II) CH_{54} > O_2 > H_2$

D.

$(I) H_2 < O_2 < He < CO_2 \quad (II) O_2 > CH_4 > H_2$

Answer: C

Watch Video Solution

4. Maximum deviation from ideal gas is expected from

A. $NH_3(g)$

B. $H_2(g)$

C. $N_2(g)$

D. $CH_4(g)$

Answer: A

Watch Video Solution

5. If helium is allowed to expand in vacuum, it liberates heat because

A. Helium Is an ideal gas

B. Helium is an inert gas

C. The inversino temperature of helium is very low

D. The boiling point of helium is the lowest among the elements

Answer: C

Watch Video Solution

6. Under what conditions to gases show maximum deviations from ideal gas behaviour ?

A. $0^\circ C$ and 1 atmospheric pressure

B. $100^{\circ} C$ and 2 atmospheric pressure

C. $-100^{\circ} C$ and 5 atmospheric pressure

D. $500^{\circ} C$ and 1 atmospheric pressure

Answer: C

Watch Video Solution

7. A gas deviated from ideal behaviour at a high pressure because its molecules

A. Have kinetic energy

B. Are bound by covalent bond

C. Attract one another

D. Show the Tyndall effect

Answer: C

Watch Video Solution

8. The temperature at which the second virial coefficient of a real gas is zero is called .

A. Critical temperature

B. Entetic point

C. Boiling point

D. Boyle's temperature

Answer: D

Watch Video Solution

9. In which of the following molecules the van der Waals forces are likely to be the most important in determining the mpt. and b.pt.?

A. H_{20S}

B. Br_2

C. HCl

D. CO

Answer: B

Watch Video Solution

10. The units of constants a in van der Waal's equation is

A. dm^6 atm mol^{-2}

B. dm^3 atm mol^{-1}

C. dm atm mol^{-1}

D. atm mol^{-1}

Answer: A

Watch Video Solution

11. In van der Waals' equation of state of the gas law the constnat 'b' is a measure of .

A. Volume occupied by the molecues

B. Intermolecular attraction

C. Intermolecular repulsions

D. Intermolecular collisions per unit volume

Answer: A

Watch Video Solution

12. The compressibility factor for a real gas at high pressure is .

A. $1 + RT / pb$

B. 1

C. $1 + pb / RT$

D. $1 - pb / RT$

Answer: C

Watch Video Solution

13. The vander waal's constant "a" for gases P,Q,R and S are 4.17 , 359 . 6.71 & 3.8 atm $L^2 \ \ \mathrm{mol}^{-2}$. Therefore , the ascending order of their ease of liquefaction is :-

A. $R < P < S < Q$

B. $Q < S < R < P$

C. $Q < S < P < R$

D. $R < P < Q < S$

Answer: C

Watch Video Solution

14. Pressure exerted by 1 mole of methane, in a 0.25 litre container at $300K$ using van der Waals' equation (given $a = 2.253 atm L^2 mol^{-2}, b = 0.0428 L mol^{-}$) is

A. 82.82 atm

B. 152.1 atm

C. 190.52 atm

D. 70.52 atm

Answer: A

Watch Video Solution

15. What is the pressure of 2 mole of NH_3 at $27^\circ C$ when its volume is 5 lit. in Van der Waal's equation ? $(a = 4.17, b = 0.03711)$

A. $10.33atm$

B. 9.33 atm

C. 9.74 atm

D. 9.2 atm

Answer: B

Watch Video Solution

16. At low pressure, the van der Waals equation is reduced to

A. $Z = \frac{pV_m}{RT} = 1 - \frac{ap}{RT}$

B. $Z = \frac{pV_m}{RT} = 1 + \frac{b}{RT}p$

C. $pV_m = RT$

D. $Z = \frac{pV_m}{RT} = 1 - \frac{a}{RT}$

Answer: A

Watch Video Solution

17. At high temperature and low pressure the van der Waals equation is reduced to .

A. $\left(p+\frac{a}{V_m^2}\right)(V_m)=RT$

B. $pV_m=RT$

C. $p(V_m-b)=RT$

D. $\left(p+\frac{a}{V_m^2}\right)(V_m-b)=RT$

Answer: B

Watch Video Solution

18. Given van der Waals constant for NH_3, H_2, O_2 and CO_2 are respectively $4.17, 0.244, 1.36$ and 3.59, which one of the following gases is most easily liquefied?

A. NH_3

B. H_2

C. O_2

D. CO_2

Answer: A

Watch Video Solution

19. The correction factor 'a' to the ideal gas equation corresponds to

A. Density of the gas molecules

B. Volume of the gas molecules

C. Electric field present between the gas molecules

D. Forces of attraction between the gas molecules

Answer: D

Watch Video Solution

Ordinary Thinking Objective Questions Critical State And Liquefaction Of Gases

1. An ideal gas cannot be liquified because

A. Its critical temperature is always above $0^{\circ} C$

B. Its molecules are relatively smaller in size

C. It solidifies before becoming a liquid

D. Forces operative between its molecules are negligibel

Answer: D

Watch Video Solution

2. An ideal gas obeying the kinetic theory of gases can be liquefied if

A. Its temperature is more than critical temperature T_c

B. Its pressure is more than critical pressure P_c

C. Its pressure is more than P_c at a tempeature less than T_c

D. It cannot be liquefied at any value of P and T

Answer: D

Watch Video Solution

3. Adiabatic demagnetisation is atechnique used for

A. Adiabatic expansion of a gas

B. Production of low temperature

C. Production of high temperature

D. None

Answer: B

Watch Video Solution

4. A gas is liquefied

A. Above critical temperature and below cricical pressure

B. Below critical temperature and above critical pressure

C. Below critical temperature and pressure

D. Above critical temperature and pressure

Answer: C

View Text Solution

5. $4.48L$ of an ideal gas at STP requires 12 cal to raise its temperature by $15^\circ C$ at constant volume. The C_P of

the gas is

A. 3 cal

B. 4 cal

C. 7 cal

D. 6 cal

Answer: D

Watch Video Solution

6. The gas with the highest critical temperature is

A. H_2

B. He

C. N_2

D. CO_2

Answer: d

Watch Video Solution

7. Weight of $112ml$ of oxygen at NTP on liquefaction would be

A. $0.32g$

B. $0.64g$

C. $0.16g$

D. $0.96g$

Answer: C

Watch Video Solution

8. Critical temperature of H_2O, NH_3, CO_2 and O_2 are 647 K, 405.6 K, 304.10 K and 1542 K respectively. If the cooling starts from 500 K to their critical temperature, the gas that lilquiefies first is

A. H_2O

B. NH_3

C. CO_2

D. O_2

Answer: B

Watch Video Solution

9. The critical temperatures of O_2, N_2, H_2 and CO_2 are $154.3K$, $126K$, $33.2K$, and $304K$ respectively. The extent of adsorption on tungsten is highest in case of

A. H_2

B. N_2

C. O_2

D. CO_2

Answer: D

Watch Video Solution

10. a' and 'b' are van der Waals' constants for gases Chlorine is more easily liquefied than ethane because .

A. a and b for $Cl_2 >$ a and b for C_2H_6

B. a and b for Cl_2 a and b for C_2H_6

C. a and $Cl_2 <$ a for C_2H_6 but b for $Cl_2 > b$ for C_2H_6

D. a for $Cl_2 > a$ for C_2H_6 but b for $Cl_2 < b$ for C_2H_6

Answer: D

Watch Video Solution

Watch Video Solution

11. Which of the following is correct for critical temperature

A. It is the highest temperature at which liquid and vapour can coexist

B. Beyond the critical temperature, there is no distinction between the two phases and a gas cannot be liquefied by compression

C. At critical temperature (T_c) the surface tension of the system is zero

D. At critical temperature the gas and the liquid phases have different critical densities.

Answer: A::B::C

View Text Solution

12. The van der Waals parameters for gases W, X, Y and Z are

Gas	$a\left(\text{atm}L^2mol^{-2}\right)$	$b\left(L\text{mol}^{-1}\right)$
W	4.0	0.027
X	8.0	0.030
Y	6.0	0.032
Z	12.0	0.027

Which one of these gases has the highest critical temperature?

A. W

B. X

C. Y

D. Z

Answer: D

Watch Video Solution

13. A gas has a density of $2.68 gL^{-1}$ at 1 atm and 273 K.

Identify it:

A. NO_2

B. Kr

C. COS

D. $SO_2\backslash$

Answer: C

Watch Video Solution

Critical Thinking Objective Questions

1. At what temperature will the average speed of CH_4 molecules have the same value as O_2 has at 300 K

A. 1200K

B. 150 K

C. 600 K

D. 300 K

Answer: B

View Text Solution

2. If molecular mass of O_2 and SO_2 are 32 and 64 respectively. If one litre of O_2 at $15^\circ C$ and 759mm pressure contains N molecules, the number of molecuels in two litre of SO_2 under the same conditions of temperature and pressure will be:

A. $N/2$

B. Number of the molecules of gas increases

C. 2N

D. 4N

Answer: C

Watch Video Solution

3. A sample of O_2 gas is collected over water at $23^\circ C$ at a barometric pressure of 751 mm Hg (vapour pressure of water at $23^\circ C$ is 21 mm Hg). The partical pressure of O_2 gas in the sample collected is

A. 21 mm Hg

B. 751 mm Hg

C. $0.96atm$

D. 1.02 atm

Answer: C

Watch Video Solution

4. 50 mL of hydrogen diffuse through a small hole from a vessel in 20 mintues time. Time taken for 40 ml of oxygen to diffuse out under similar conditions will be :

A. 12 min

B. 64 min

C. 8 min

D. 32 min

Answer: B

Watch Video Solution

5. If pressure becomes double at the same absolute temperature on $2LCO_2$, then the volume of CO_2 becomes

A. 2L

B. 4L

C. 25L

D. 1L

Answer: D

Watch Video Solution

6. Pressure of a mixture of 4 g of O_2 and $2gH_2$ confined in a bulb of 1 litre at $0^\circ C$ is

A. 25.215 atm

B. 31.205 atm

C. 45.215 atm

D. 15.210 atm

Answer: A

Watch Video Solution

7. The ratio of rates of diffusion of SO_2, O_2 and CH_4 is

A. $1:\sqrt{2}:2$

B. $1:2:4$

C. $2:\sqrt{2}:1$

D. $1:2:\sqrt{2}$

Answer: A

Watch Video Solution

8. Some moles of O_2 diffuse through a small opening in 18 second. Same number of moles of an unknown gas diffuse through the same opening in 45 second. Molecular mass of the unknown gas is

A. $\frac{45^2}{18^2} \times 32$

B. $\frac{18^2}{45^2} \times 32$

C. $\frac{18^2}{45^2 \times 32}$

D. $\frac{45^2}{18^2 \times 32}$

Answer: A

Watch Video Solution

9. What is the relationship between the average velocity (v), root mean square velocity (u) and most probable velocity

A. $\alpha : v : u : : 1 : 1.128 : 1.224$

B. $\alpha : v : u : : 1.128 : 1 : 1.224$

C. $\alpha : v : u : : 1.128 : 1.224 : 1$

D. $\alpha : v : u : : 1.124 : 1.228 : 1$

Answer: A

Watch Video Solution

10. A bubble of gas released at the bottom of a lake increases to four times its original volume when it reaches the surface. Assuming that atmospheric pressure is equivalent to the pressure exerted by a column of water 10 m high, what is the depth of the lake?

A. 80m

B. 90m

C. 40m

D. 70m

Answer: D

Watch Video Solution

11. $300ml$ of a gas at $27^\circ C$ is cooled to $-3^\circ C$ at constant pressure, the final volume is

A. 540 ml

B. 135 ml

C. 270 ml

D. 350 ml

Answer: C

Watch Video Solution

12. As the temperature is raised from $20^\circ C$ to $40^\circ C$ the averge kinetic energy of neon atoms changes by a factor .

A. $313/293$

B. $\sqrt{(313/293)}$

C. $1/2$

D. 2

Answer: A

Watch Video Solution

13. In an experiment during the analysis of a carbon compound, 145L of H_2 was collected at 760 mm of Hg pressure and $27^\circ C$ temperature. The mass of H_2 is near.

A. 10g

B. 12g

C. 24g

D. 6g

Answer: B

Watch Video Solution

14. For an ideal system at thermal equilibrium, the velocity distribution of the constituting particles will be governed by

A. Gaussian distribution

B. Maxwell-Boltzmann distribution

C. Lorentzian distribution

D. Log-normal distribution

Answer: B

Watch Video Solution

15. A gas is found to have a formula $[CO]_x$. If its vapour density is 70, then value of x is

A. 2.5

B. 3.0

C. 5.0

D. 6.0

Answer: C

 Watch Video Solution

16. At what temperature in the Celsius scale, V (volume) of a certain mass of a gas at $27^\circ C$ will be doulbed

keeping the pressure constant ?

A. $54^{\circ} C$

B. $327^{\circ} C$

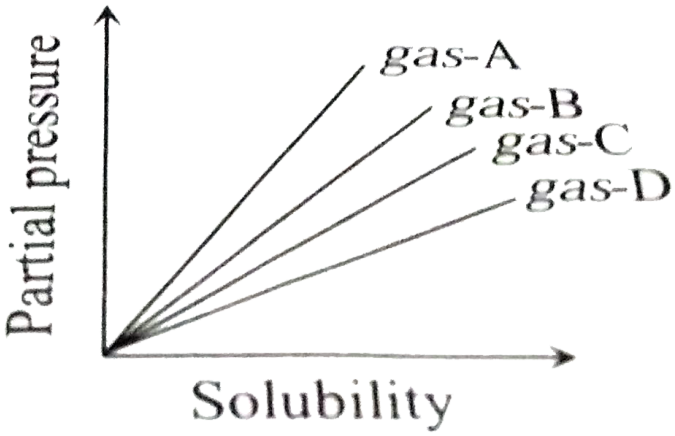
C. $427^{\circ} C$

D. $527^{\circ} C$

Answer: B

Watch Video Solution

17. From the given graph at constant temperature, which gas has the least solubility



A. Gas -D

B. Gas-B

C. Gas-A

D. Gas -C

Answer: C

Watch Video Solution

18. Consider the following statements for diatomic gases, the ratio C_p / C_v is equal to

(1) 1.40 (lower temperature)

(2) 1.66 (moderate temperatre)

(3) 1.29 (higher temperature)

which of the above statements are correct

A. 1,2 and 3

B. 1 and 2

C. 2 and 3

D. 1 and 3

Answer: D

Watch Video Solution

19. Volume of the air that will be expelled from a vessel of $300cm^3$ when it is heated from $27^\circ C$ to $37^\circ C$ at the same pressure will be

A. $310cm^3$

B. $290cm^3$

C. $10cm^3$

D. $37cm^3$

Answer: C

Watch Video Solution

Jee Section Only One Choice Answer

1. Equal weights of methane and oxygen are mixed in an empty container at $25^{\circ}C$. The fraction of the total pressure exerted by oxygen is

A. $\frac{1}{3}$

B. $\frac{1}{2}$

C. $\frac{2}{3}$

D. $\frac{1}{3} \times \frac{273}{298}$

Answer: A

Watch Video Solution

2. The ratio of root mean square velocity of average velocity of a gas molecule at a particular temperture is

A. $1.086:1$

B. $1:1.086$

C. $2:1.086$

D. $1.086:2$

Answer: A

Watch Video Solution

3. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called

A. Critical temperature

B. Boyle temperature

C. Inversion temperature

D. Reduced temperature

Answer: B

Watch Video Solution

4. A helium atom is two times heavier than a hydrogen molecule. At $298K$, the average kinetic energy of a helium atom is

A. Two times that of a hydrogen molecule

B. Same as that of a hydrogen molecule

C. Four times that of a hydrogen molecule

D. Half that of a hydrogen molecule

Answer: B

Watch Video Solution

5. When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules

A. Are above the inversion temperature

B. Exert no attractive force on each other

C. Do work equal to loss in kinetic energy

D. Collide without loss of energy

Answer: B

Watch Video Solution

6. The rate of diffusion of a gas is

A. Directly proportional to its density

B. Directly proportional to its molecular weight

C. Directly proportional to the square root of its molecular weight

D. Inversely proportional to the square root of its molecular weight

Answer: D

Watch Video Solution

7. The average velocity of an ideal gas molecule at $27^\circ C$ is $0.3ms^{-1}$. The average velocity at $927^\circ C$ will be

A. 0.6 $m/$ sec

B. $0.3m/$ sec

C. $0.9m/$ sec

D. $3.0m/$ sec

Answer: A

Watch Video Solution

8. A bottle of dry ammonia and a bottle of dry hydrogen chloride connected through a long tube are opened simultaneously at both ends. The white ammonium chloride ring first formed will be

A. At the centre of the tube

B. Near the hydrogen chloride bottle

C. Near the ammonia bottle

D. Throughout the length of the tube

Answer: B

 Watch Video Solution

9. The Vander Waal's constant 'a' for the gases O_2, N_2, NH_3 and CH_4 are 1.3, 1.390, 4.170 and 2.253 L^2 atm mol^{-2} respectively. The gas which can be most easily liquefied is

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

View Text Solution

10. Same mass of CH_4 and H_2 is taken in container. The partial pressure caused by H_2 is

A. $8/9$

B. $1/9$

C. $1/2$

D. 1

Answer: A

Watch Video Solution

11. The density of neon will be highest at

A. S.T.P.

B. $0^{\circ} C$, 2 atm

C. $273^{\circ} C$, 1 atm

D. $273^{\circ} C$, 2 atm

Answer: B

Watch Video Solution

12. The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is

A. 64.0

B. 32.0

C. 4.0

D. 8.0

Answer: A

13. According to kinetic theory of gases, for a datomic molecule.

A. The pressure exerted by the gas is proportional to mean velocity of the molecule

B. The pressure exerted by the gas is proportional to the root mean velocity of the molecule

C. The root mean square velocity of the molecule is inversely proportional to the temperature

D. The mean translational kinetic energy of the molecule is proportioanl to the absolute temperature

Answer: D

Watch Video Solution

14. At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with the rise in temperature due to

A. Increase in average molecular speed

B. Increased rate of collisions amongst molecules

C. Increase in molecular attraction

D. Decrease in mean free path

Answer: A

Watch Video Solution

15. Van der Waal's equation of state is obeyed by real gases. For n moles of a real gas the expression will be

A. $\left(\frac{P}{n}+\frac{na}{V^2}\right)\left(\frac{V}{n-b}\right)=RT$

B. $\left(P+\frac{a}{V^2}\right)(V-b)=nRT$

C. $\left(P+\frac{na}{V^2}\right)(nV-b)=nRT$

D. $\left(P+\frac{n^2a}{V^2}\right)(V-nb)=nRT$

Answer: D

Watch Video Solution

16. A constant volume and temperature conditions, the rate of diffusion D_A and D_B of gases A and B having

densities ρ_A and ρ_B are related by the expression

A. $D_A = \left[D_B . \frac{\rho_A}{\rho_B}\right]^{1/2}$

B. $D_A = \left[D_B . \frac{\rho_A}{\rho_B}\right]^{1/2}$

C. $D_A = D_B \left(\frac{\rho_A}{\rho_B}\right)^{1/2}$

D. $D_A = D_B \left(\frac{\rho_B}{\rho_A}\right)^{1/2}$

Answer: D

Watch Video Solution

17. If $C_1, C_2, C_3 \ldots .$ represent the speeds on $n_1, n_2, n_3 \ldots .$ molecules, then the root mean square speed is

A. $\left(\frac{n_1C_1^2 + n_2C_2^2 + n_3C_3^2 + \ldots\ldots\ldots}{n_1 + n_2 + n_3 + \ldots\ldots}\right)^{1/2}$

B. $\frac{(n_1C_1^2 + n_2C_2^2 + n_3C_3^2 + \ldots\ldots\ldots)^{1/2}}{n_1 + n_2 + n_3 + \ldots\ldots}$

C. $\frac{(n_1C_1^2)^{1/2}}{n_1} + \frac{(n_2C_2^2)^{1/2}}{n_2} + \frac{(n_3C_3^2)^{1/2}}{n_3} + \ldots\ldots$

D. $\left[\frac{(n_1C_1 + n_2C_2 + n_3C_3 + \ldots.)^2}{(n_1 + n_2 + n_3 + \ldots.)}\right]^{1/2}$

Answer: A

Watch Video Solution

18. Longest mean free path stands for

A. H_2

B. N_2

C. O_2

D. Cl_2

Answer: A

Watch Video Solution

19. दी गयी गैसों के लिए वान्डर वाल्स गैस स्थिरांक a का सही क्रम होगा

:

(I)	$C_6H_5(g)$	A	0.217
(II)	$C_6H_5 \cdot CH_3(g)$	B	5.464
(III)	$Ne(g)$	C	18.000
(IV)	$H_2O(g)$	C	24.060

A. $I-A, II-D, III-C, IV-B$

B. $I-D, II-A, III-B, IV-C$

C. $I - C, II - D, III - A, IV - B$

D. $I - B, II - C, III - A, IV - D$

Answer: C

Watch Video Solution

20. The ratio between the root mean square speed of H_2 at $50K$ and that of O_2 at $800K$ is

A. 4

B. 2

C. 1

D. $1/4$

Answer: C

Watch Video Solution

21. One mole of $N_2O(g)$ at $300K$ is kept in a closed container under one atmosphere. It is heated to $600K$ when $20\,\%$ by mass of $N_2O_4(g)$ decomposes of $NO_2(g)$. The resultant pressure

A. $1.2atm$

B. 2.4 atm

C. 2.0 atm

D. 1.0 atm

Answer: B

Watch Video Solution

22. XmL of H_2 gas effuses through a hole in a container is 5 second. The time taken for the effusion of the same volume of the gas specified below under identical conditions is .

A. 10 seconds : He

B. 20 seconds : O_2

C. 25 seconds : CO

D. 55 seconds : CO_2

Answer: B

Watch Video Solution

23. Compressibility factor $Z = \frac{PV}{RT}$. Considering ideal gas, real gas, and gases at critical state, answer the following questions:

The cpmpressibility factor of an ideal gas is

A. 0

B. Infinity

C. 1

D. -1

Answer: C

Watch Video Solution

24. According to Graham's law, at a given temperature, the ratio of the rates of diffusion r_A / r_B of gases A and B is given by

A. $(P_A / P_B)(M_A / M_B)^{1/2}$

B. $(M_A / M_B)(P_A / P_B)^{1/2}$

C. $(P_A / P_B)(M_B / M_A)^{1/2}$

D. $(M_A / M_B)(P_B / P_A)^{1/2}$

Answer: C

Watch Video Solution

25. A gas is said to behave like an ideal gas when the relation $\frac{pV}{T}$= constant. When do you expect a real gas to behave like an ideal gas ?

A. When the temperature is low

B. When both the temperature and pressure are low

C. When both the temperature and pressure are high

D. When the temperature is high and pressure is low

Answer: D

Watch Video Solution

26. The rms velocity of hydrogen is $\sqrt{7}$ times the rms velocity of nitrogen. If T is the temperature of the gas, then

A. $T(H_2) = T(N_2)$

B. $T(H_2) > T(N_2)$

C. $T(H_2) < T(N_2)$

D. $T(H_2) = \sqrt{7}T(N_2)$

Answer: C

Watch Video Solution

27. The compressibility of a gas is less than unity at STP.

A. $V_m > 22.4$ litres

B. $V_m < 22.4$ litres

C. $V_m = 22.4$ litres

D. $V_m = 44.8$ litres

Answer: B

Watch Video Solution

28. At $100^\circ C$ and $1atm$, if the density of the liquid water is $1.0gcm^{-3}$ and that of water vapour is

$0.0006 gcm^{-3}$, then the volume occupied by water molecules in $1L$ of steam at this temperature is

A. $6cm^3$

B. $60cm^{30}$

C. $0.6cm^3$

D. $0.06cm^3$

Answer: C

Watch Video Solution

29. The root mean square velocity of an ideal gas to constant pressure varies with density (d) as

A. d^2

B. d

C. $\sqrt{d}$

D. $1/\sqrt{d}$

Answer: D

Watch Video Solution

30. The compression factor (compressibility factor) for $1mol$ of a van der Waals gas at $0^\circ C$ and $100atm$ pressure is found to be 0.5. Assuming that the volume of a gas molecule is neligible, calculate the van der Waals constant a.

A. $0.253 L^2 mol^{-2}$ atm

B. $0.53 L^2 mol^{-2}$ atm

C. $1.83 L^2 mol^{-2}$ atm

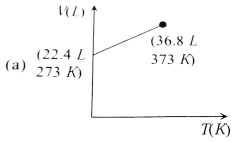
D. $1.253 L^2 mol^{-2}$ atm

Answer: D

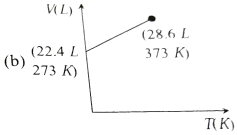
Watch Video Solution

31. Which of the following volume-temperature $(V - I)$ plots represents the behaviour of 1mole of an ideal gas at the atmospheric pressure?

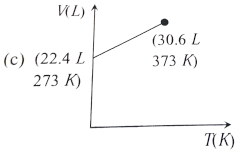
A.



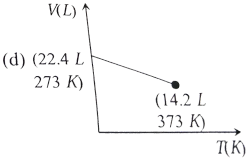
B.



C.



D.



Answer: C

Watch Video Solution

32. When the temperature is increased, surface tension of water:

A. Increase

B. Decreases

C. Remains constant

D. Show irregular behaviour

Answer: B

Watch Video Solution

33. Positive deviation from ideal behaviour takes place because of

A. Molecular interactioin between atoms and $PV/nRT > 1$

B. Molecular interaction between atoms and $PV/nRT < 1$

C. Finite size of atoms and $PV/nRT > 1$

D. Finite size of atoms and $PV/nRT < 1$

Answer: C

Watch Video Solution

34. The root mean square speed of one mole of a monoatomic gas having molecular mass M is u_{rms} The

relation between the average kinetic energy (E) of the gas and $u_9rms)$ is .

A. $u_{r.m.s.} = \sqrt{\frac{3E}{2M}}$

B. $u_{r.m.s.} = \sqrt{\frac{2E}{3M}}$

C. $u_{r.m.s.} = \sqrt{\frac{2E}{M}}$

D. $u_{r.m.s.} = \sqrt{\frac{E}{3M}}$

Answer: C

Watch Video Solution

35. When $1mol$ of a monoatomic ideal gas at TK undergoes adiabatic change under a constant external

pressure of $1atm$, changes volume from $1L \rightarrow 2L$. The final temperature (in K) would be

A. $\frac{T}{2^{(2/3)}}$

B. $T + \frac{2}{3} \times 0.0821$

C. T

D. $T - \frac{2}{3} \times 0.0821$

Answer: A

Watch Video Solution

36. The ratio of the rate of diffusion of helium and methane under indentical conditions of pressure and

temperature will be

A. 4

B. 2

C. 1

D. 0.5

Answer: B

Watch Video Solution

37. A monotomic ideal gas undergoes a process in which the ratio of p to V at any instant is constant and equals to 1. what is the molar heat capacity of the gas?

A. $\frac{4R}{2}$

B. $\frac{3R}{2}$

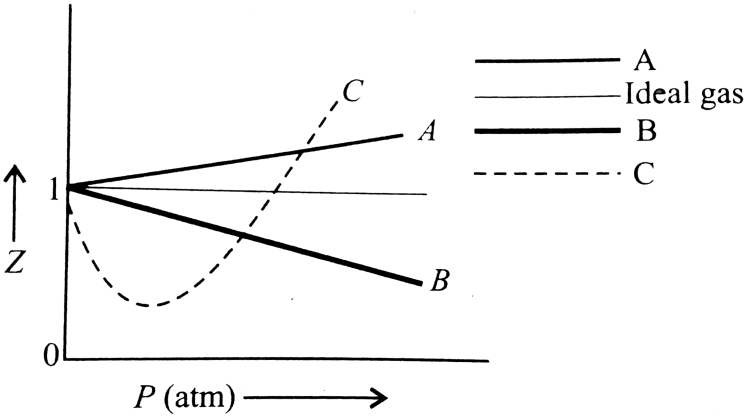
C. $\frac{5R}{2}$

D. 0

Answer: C

Watch Video Solution

38. The given graph represents the variations of compressibility factor $Z = PV/nRT$ vs P for three real gases A, B, and C.



Identify the incorrect statements.

A. For the gas A, $a = 0$ and its dependence on P is linear at all pressure

B. For the gas B, $b = 0$ and its dependence on P is linear at all pressure

C. For the gas C, which is typical real gas for which neither a nor $b = 0$. By knowing the minima and

the point of intersection , with $z = 1$, a and b can be calculated

D. At high pressure , the slope is positive for all real gases

Answer: B

Watch Video Solution

39. The term that corrects for the attractive forces present in a real gas in the van der Waal's equation is

A. nb

B. $\frac{an^2}{V^2}$

C. $-\frac{an^2}{V^2}$

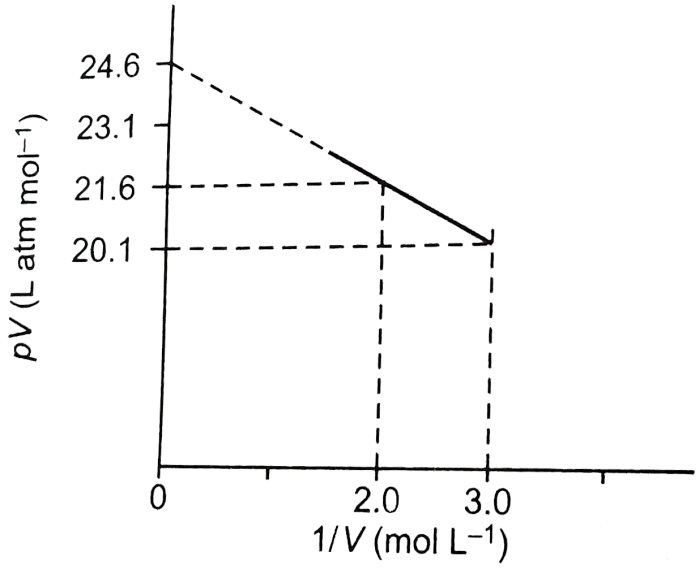
D. $-nb$

Answer: B

Watch Video Solution

40. For one mole of a van der Waals' gas when $b = 0$ and $T = 300K$, the $pVvs1/V$ plot is shown below. The

value of the vander Waals' constant a(atm $Lmol^{-2}$)



A. 1.0

B. 4.5

C. 1.5

D. 3.0

Answer: C

Watch Video Solution

41. For gaseous state, if most probable speed is denoted by C^* average speed by $\overline{C}$ and root square speed by C, then for a large number of molecules, the ratios of these speeds are

A. $C^* : \overline{C} : C = 1.225 : 1.128 : 1$

B. $C^* : \overline{C} : C = 1.128 : 1.225 : 1$

C. $C^* : \overline{C} : C = 1 : 1.128 : 1.225$

D. $C^* : \overline{C} : C = 1 : 1.225 : 1.128$

Answer: C

Watch Video Solution

42. If Z is a compressibility factor, van der Waals' equation at low pressure can be written as

A. $Z = 1 + \frac{RT}{Pb}$

B. $Z = 1 - \frac{a}{VRT}$

C. $Z = 1 - \frac{Pb}{RT}$

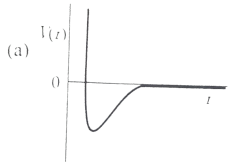
D. $Z = 1 + \frac{Pb}{RT}$

Answer: B

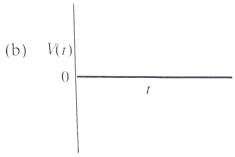
Watch Video Solution

43. One mole of a monoatomic real gas satisfies the equation $p(V-b)=RT$ where b is a constant. The relationship of interatomic potential $V(r)$ and interatomic distance r for gas is given by

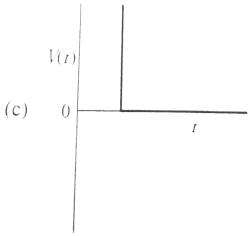
A.

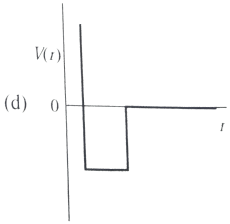


B.



C.





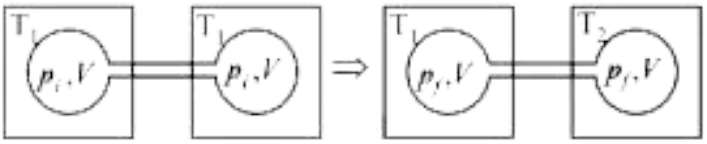
D.

Answer: C

Watch Video Solution

44. Two closed bulbs of equal volume (V) containing an ideal gas initially at pressure p_i and temperature T_1 are connected through a narrow tube of negligible volume as shown in the figure below. The temperature of one of

the bulbs is then raised to T_2. The final pressure p_f is:



A. $2P_i\left(\frac{T_1}{T_1+T_2}\right)$

B. $2P_i\left(\frac{T_2}{T_1+T_2}\right)$

C. $2P_i\left(\frac{T_1T_2}{T_1+T_2}\right)$

D. $P_i\left(\frac{T_1T_2}{T_1+T_2}\right)$

Answer: B

Watch Video Solution

Jee Section More Than One Choice Correct Answer

1. If a gas expended at constant temperature

A. The pressure decreases

B. The kinetic energy of the molecules remains the same

C. The kinetic energy of the molecules decreases

D. The number of molecules of the gas increases

Answer: AB

Watch Video Solution

2. Energy of sublimation of solid helium is much lower than that of ice because

A. A large part of sublimation energy of ice is used to overcome hydrogen bonding

B. Ice melts at much higher temperature

C. In solid helium, there is Vander Waal's force of attraction between helium atoms

D. None is true

Answer: A::B::D

 Watch Video Solution

3. A gas described by van der Waal's equation:

A. Behaves similar to an ideal gas in the limit of large molar volumes

B. Behaves similar to an ideal gas in the limit of leart pressures

C. Is characterised by vander Waal's coefficients that are dependent on the identity of the gas but are independent of the temperature

D. Has the pressure that is lower than the pressure exerted by the same gas behaving ideally

Answer: A::C::D

Watch Video Solution

4. According to kinetic theory of gases,

A. Collisions are always elasic

B. Heavier molecules transfer more momentum to the wall of the container

C. Ony a small number of molecules have very high velocity

D. Between collisions, the molecules move in straight lines with constant velocities

Answer: A::B::C::D

Watch Video Solution

Watch Video Solution

5. Which of the following statements are incorrect?

A. Molar volume of every gas at STP is 22.4 L

B. Under critical states compressiblity factor is 1

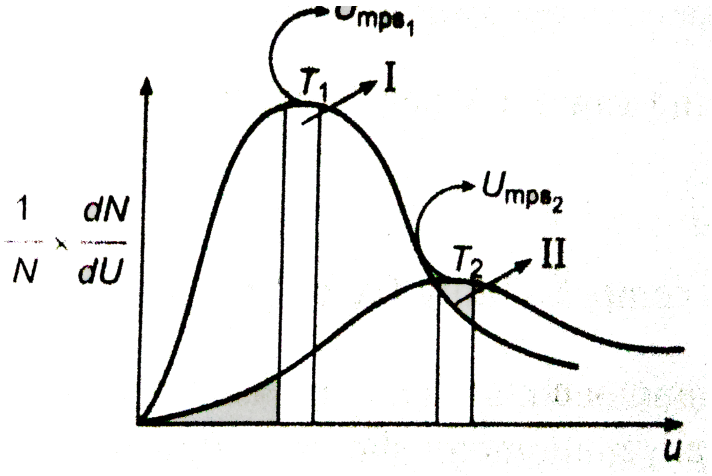
C. All gases will have equal value of average KE at a given temperature

D. At absolute zero, KE is $\frac{3}{2}$ R

Answer: B::D

Watch Video Solution

6. Following represents the Maxwell distribution curve for an ideal gas at two temperature T_1 and T_2 . Which of the following option(s) is/are true?



A. Total area under the two curves is independent of moles of gas

B. If $dU_1 = fU_{mps_1}$ and $dU_2 = fU_{mps_2}$ then $A_1 = A_2$

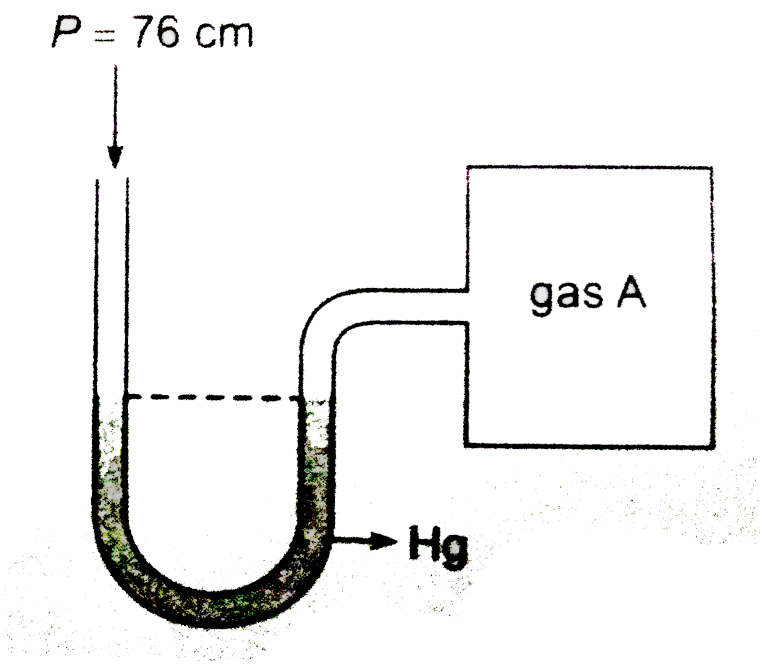
C. $T_1 > T_2$ and hence higher the temperature, sharper the curve

D. The fraction of molecules having speed $= U_{mps}$ decreases as temperature increases

Answer: ABD

Watch Video Solution

7. A open ended mercury manometer is used to measure the pressure exerted by a trapped gas as shown in the figure. Initially manometer shows no difference in mercury level in both columns as shown in diagram.



After sparking 'A' dissociates according to following reaction

$A(g) \rightarrow B(g) + 3C(g)$

If pressure of Gas "A" dissociates to 0.9 atm, then (Assume temperature to be constant and is 300 K)

A. Total pressure increased by 1.3 atm

B. Total pressure increased by 0.3 atm

C. Total pressure increased by 22.3 cm of Hg

D. Difference in mercury level is 228 mm

Answer: ABD

Watch Video Solution

Jee Section Reasoning Type Questions

1. Assertion : The value of van der Waal's constant a is larger for ammonia than for nitrogen

Reason : Hydrogen bonding is present in ammonia

A. Statement 1 is true, statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true, statement 2 is Not a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false , statement 2 is true.

Answer: A

Watch Video Solution

2. Statement-1: CH_4, CO_2 has value of Z (compressibility factor) less than one, generally. Statement-2: $Z < 1$ is due to repulsive forces among the molecules.

A. Statement 1 is true, statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true, statement 2 is Not a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false , statement 2 is true.

Answer: C

Watch Video Solution

3. Statement 1 : Critical temperature is the temperature at which a real gas exhibits ideal behaviour for considerable range of pressure.

Statement 2 : At critical point the densities of a substance in gaseous and liquid states are same.

A. Statement 1 is true, statement 2 is true , statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true, statement 2 is Not a correct explanation for statement 1.

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false , statement 2 is true.

Answer: D

Watch Video Solution

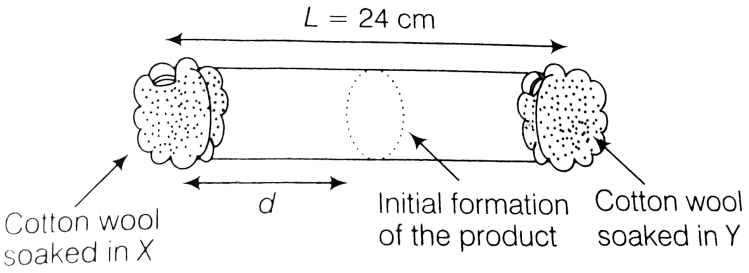
Jee Section Comprehension Type Question Passage I

1. X and Y are two volatile liquids with molar weights of $10gmol^{-1}$ and $40gmol^{-1}$ respectively. Two cotton plugs, one soaked in X and the other soaked in Y, are

simultaneously placed at the ends of a tube of length $L = 24$ cm, as shown in the figure.

The tube is filled with an inert gas at 1 atm pressure and a temperature of $300K$. Vapours of X and Y react to form a product whichh is first observed at a distance d cm from the plug soaked in X.

Take X and Y to have equal molecular diameters and assume ideal behaviour for the inert gas and two vapours.



The value of d in cm (shown in figure), as estimated from Graham's law, is

A. 8

B. 12

C. 16

D. 20

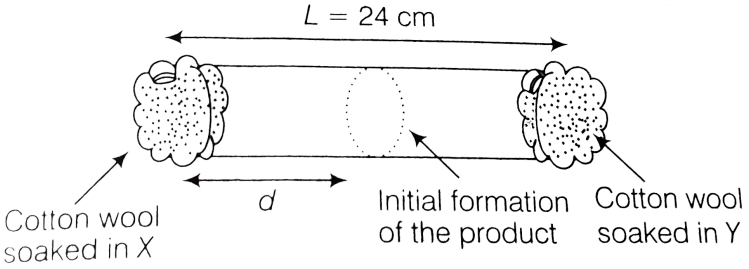
Answer: C

Watch Video Solution

2. X and Y are two volatile liquids with molar weights of $10gmol^{-1}$ and $40gmol^{-1}$ respectively. Two cotton plugs, one soaked in X and the other soaked in Y, are simultaneously placed at the ends of a tube of length $L = 24$ cm, as shown in the figure.

The tube is filled with an inert gas at 1 atm pressure and a temperature of $300K$. Vapours of X and Y react to form a product whichh is first observed at a distance d cm from the plug soaked in X.

Take X and Y to have equal molecular diameters and assume ideal behaviour for the inert gas and two vapours.



The value of d in cm (shown in figure), as estimated from Graham's law, is

A. Larger mean free path for X as compared to that of Y

B. Larger mean free path for Y as compared to that of X

C. Increased collision frequency of Y with the inert gas as compared to that of X with the inert gas

D. Increased collision frequency of X with the inert gas as compared to that of Y with the inert gas

Answer: D

Watch Video Solution

Jee Section Comprehension Type Question Passage Ii

1. One of the approach to the study of real gases involves the analysis of a parameter Z called the compressibility factor $Z = \frac{PV_m}{RT}$ where P is pressure, V_m is molar volume, T is absolute temperature and R is the universal gas constant . Such a relation can also be expressed as $Z = \left(\frac{V_{\text{m real}}}{V_{\text{m ideal}}}\right)$ (where $V_{\text{m ideal}}$ and $V_{\text{m real}}$ are the molar volume for ideal and real gas respectively) . Gas corresponding $Z > 1$ have repluive tendenciesamong constituent particles due to their size factor, among constitutent particles . As the pressure is lowered or temperature is increased the value of Z approaches 1. (reaching the ideal behaviour)

For a real gas $'G'$ $Z > 1$ at STP then for $'G'$ which of the following is true

A. 1 mole of the gas occupies 22.4 L at NTP

B. 1 mole of the gas occupies 22.4 L at pressure higher than that at STP (keeping temperature constant)

C. 1 mole of the gas occupies 22.4 L at pressure lower than that at STP (keeping temperature constant)

D. None of the above

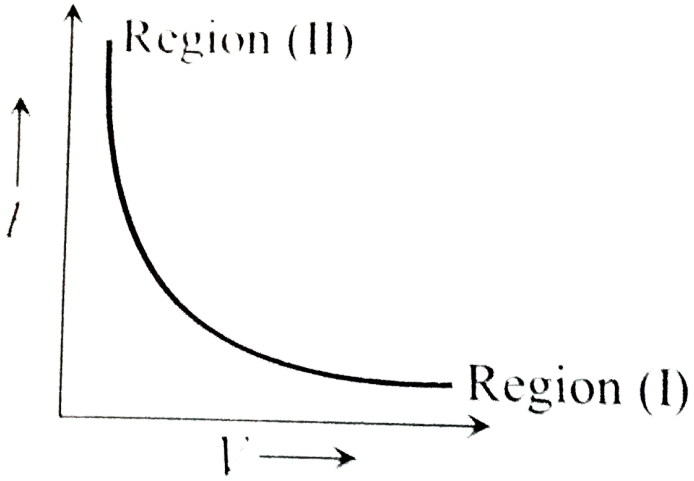
Answer: B

View Text Solution

2. One of the approach to the study of real gases involves the analysis of a parameter Z called the compressibility factor $Z = \frac{PV_m}{RT}$ where P is pressure, V_m is molar volume, T is absolute temperature and R is the universal gas constant . Such a relation can also be expressed as $Z = \left(\frac{V_{\text{m real}}}{V_{\text{m ideal}}} \right)$ (where $V_{\text{m ideal}}$ and $V_{\text{m real}}$ are the molar volume for ideal and real gas respectively) . Gas corresponding $Z > 1$ have repluive tendenciesamong constituent particles due to their size factor, among constitutent particles . As the pressure is lowered or temperature is increased the value of Z approaches 1. (reaching the ideal behaviour)

Following graph represents a pressure (P) volume (V) relationship at a fixed temperature (T) for n moles of a

real gas. The graph has two regions marked (I) and (II). Which of th following options is true.



A. $Z < 1$ in the reion (II)

B. $Z =$ in the region (II)

C. $Z = 1$ for the curve

D. Z approaches 1 as we move from region (II) to region (I)

Answer: D

View Text Solution

3. One of the approach to the study of real gases involves the analysis of a parameter Z called the compressibility factor $Z = \frac{PV_m}{RT}$ where P is pressure, V_m is molar volume, T is absolute temperature and R is the universal gas constant . Such a relation can also be expressed as $Z = \left(\frac{V_{\text{m real}}}{V_{\text{m ideal}}}\right)$ (where $V_{\text{m ideal}}$ and $V_{\text{m real}}$ are the molar volume for ideal and real gas respectively) . Gas corresponding $Z > 1$ have repluive tendenciesamong constituent particles due to their size factor, among constitutent particles . As the pressure is

lowered or temperature is increased the value of Z approaches 1. (reaching the ideal behaviour)

Choose the conclusions whcih are appropriate for the observation stated

	Observation		Conclusion
I.	$Z = 1$	I.	The gas need not be showing the ideal behaviour
II.	$Z > 1$	II.	On applying pressure the gas will respond by increasing its volume
III.	$Z < 1$	III.	The gas has the ability to be liquefied
IV.	$Z \rightarrow 1$ for low P	IV.	The gas is approaching the ideal behaviour

A. All conclusions are true

B. Conclusions I,II and IV are true

C. Conclusions I,III and IV are true

D. Conclusions III and IV are true

Answer: D

View Text Solution

Jee Section Integer Type Questions

1. At $400K$, the root mean square (rms) speed of a gas X (molecular weight = 40) is equal to the most probable speed of gas Y at 60 K. The molecular weight of the gas Y is.

Watch Video Solution

2. To an evacuated vessel with movable piston under external pressure of 1 atm 0.1 mole of He and 1.0 mole of an unknown compound vapour pressure 0.68 atm at $0^{\circ}C$ are introduced Considering the ideal gas behaviour the total volume (in litre) of the gases at $0^{\circ}C$ is close to .

Watch Video Solution

3. If the value of Avogadro numberis $6.023 \times 10^{23} mol^{-1}$ and the vaueof Boltzmann constant is $1.380 \times 10^{-23} JK^{-1}$, then the number of significant digits in the calculated value of the universal gas constant is

Watch Video Solution

4. The diffusion coefficient of an ideal gas is proportional to its mean free path and mean speed. The absolute temperature of an ideal gas is increased 4 times and its pressure is increased 2 times.As a result, the diffusion coefficient of this gas increases x times. The value of x is.....

Watch Video Solution

5. At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a

hydrocarbon having molecular formula C_nH_{2n-n}. What is the value of n?

Watch Video Solution

6. The volume occupied by 8.8 g of CO_2 at $31.1^\circ C$ and 1 bar pressure (in L) is

Watch Video Solution

7. 2g of a gas X are introduced into an evacuated flask kept at $25^\circ C$. The pressure is found to be 1 atm. If 3g of another gas Y are added to the same flask, the total

pressure becomes 1.5 atm. Assuming that ideal behaviour, the molecular mass ratio of M_x and M_y is

Watch Video Solution

Jee Section Matrix Match Type Questions

1. Match gases under specified condition listed in Column I with their proerties/laws in Column II.

Column I	Column II
(A) Hydrogen gas ($P = 200$ atm, $T = 273$K)	(P) Compressibility factor $\neq 1$
(B) Hydrogen gas ($P \sim 0, T = 273$ K)	(Q) Attractive forces are dominant
(C) CO_2 ($P = 1$ atm, $T = 273$ K)	(R) $PV = nRT$
(D) Real gas with very large molar volume	(S) $P(V - nb) = nRT$

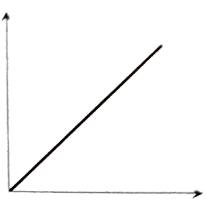
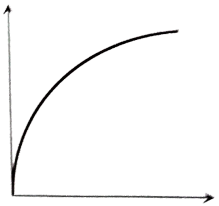
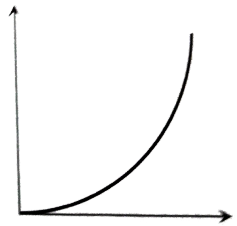
Watch Video Solution

Column I (Temperature)		Column II (Gas Characteristics)	
(A)	$> T_i$	(p)	Attractive intermolecular forces become dominant over repulsive forces when
(B)	$< T_i$	(q)	Repulsive forces become dominant
(C)	Any value of temperature	(r)	Gas becomes more or less ideal gas when
(D)	$= T_b$	(s)	$\mu_{J.T.}$ for ideal gas is zero at

2.

T_b and T_i are the Boyle's and inversion temperatures respectively for a real gas. Match the following characteritics with appropriate temperatures.

View Text Solution

Column I		Column II	
(A)	$\frac{1}{V^2}$ vs. P for ideal gas at constant T and n	(p)	
(B)	V vs. $\frac{1}{T}$ for ideal gas at constant P and n	(q)	
(C)	PT vs. T^2 for ideal gas at constant T and n	(r)	
(D)	V vs. $\frac{1}{P^2}$ for ideal gas at constant T and n	(s)	

3.

Match the entries listed in Column I with appropriate entries listed in Column II.

View Text Solution

Jee Section Jee Advanced 2018 Numeric Answer Type Question

1. A closed tank has two compartments A and B, both filled with oxygen (assumed to be ideal gas). The partition separating the two compartments is fixed and is a perfect heat insulator (Figure 1). If the old partition is replaced by a new partition which can slide and conduct heat but does NOT allow the gas to leak across (Figure 2), the volume (in m^3) of the compartment A

after the system attains equilibrium is ____.

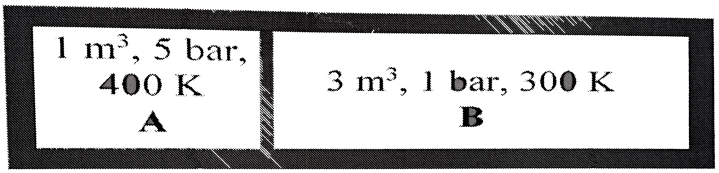
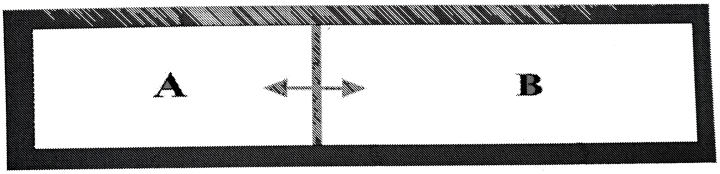


Figure 1



Watch Video Solution